

IDAHO AGRICULTURAL EXPERIMENT
STATION

MOSCOW, IDAHO

DEPARTMENT OF CHEMISTRY

THE COMPOSITION OF IRRI-
GATED AND NON-
IRRIGATED
FRUITS

J. S. JONES

C. W. COLVER

DIGEST

The analyses which are recorded on subsequent pages of this bulletin were undertaken in recognition of the commercial importance attained by the fruit industry in both irrigated and non-irrigated sections of the state. They provide something tangible upon which the relative merits of fruits grown with and without irrigation can be judged. In the analytical processes particular attention was given to the determination of those compounds which materially influence quality and whose relative amounts are assumed to be subject to greatest variation because of environmental or cultural conditions. As no samples were secured from especially controlled conditions, the results must be accepted as correctly indicating the composition of *normal* irrigated and *normal* non-irrigated fruits.

Of the drupaceous fruits this may be said: There is apparent a fairly well defined tendency for the several kinds of fruit in this division to elaborate greater percentages of solid matter when grown in the non-irrigated sections. It is believed, however, that with the exception of Italian and Petite prunes, such differences in sugar and acid as those determined are too small to seriously affect taste.

In each of the several varieties of apples whose analyses were undertaken a remarkable uniformity of composition is evident. Almost invariably the non-irrigated contain greater percentages of acid and sugar, but the differences are small; they practically disappear when these constituents are calculated to the dry or solid matter. If it can be demonstrated that irrigated, in comparison with non-irrigated apples, when stored under identical conditions, yield more quickly to the agencies which effect decay, a partial explanation might be found in a careful examination of the character of the several compounds which make up that portion of the fruit which has been designated in the tables as "insoluble solids." Apples grown with irrigation contain the smaller percentage of solids insoluble in water. The non-irrigated contain appreciably higher percentages of crude protein; they might with good reason therefore be given a *slightly* higher rating in actual food value. In intensity and uniformity of color, also in percentage of waste, the irrigated have somewhat the advantage of the non-irrigated.

With the exception of strawberries, differences between the irrigated and the non-irrigated small fruits in percentage of solid matter, and in the total sugar which that solid matter contains, are very small. The non-irrigated, however, contain appreciably greater percentages of acid and of crude protein.

From a general survey of analytical results, it may fairly be said that fruits in general manifest a well defined tendency to elaborate greater percentages of total solids or dry matter, consequently of sugar, acid, and crude protein, when grown in non-irrigated sections. With comparatively few exceptions, however, no *marked* difference between irrigated and non-irrigated fruits in actual food or market value should be charged to differences in composition.

THE COMPOSITION OF IRRIGATED AND NON-IRRIGATED FRUITS

Expression is frequently given to an apparently wide-spread belief that irrigated, in comparison with non irrigated fruits are flat in taste and less resistant to the various influences which accomplish disintegration or decay. It is not to be presumed that by chemical analyses alone, can questions relating to quality in fruits be positively settled. Still, since inquiry has developed the fact that these alleged characteristics of fruits grown with irrigation are further believed to be coincident with, if not directly attributable to, abnormally high percentages of water and correspondingly low percentages of solid matter and therefore of the particular compounds upon which taste and body or solidity of structure depend, such analyses are of fundamental importance for the settlement of questions of this kind. Moreover in a state whose fruit industry has attained such prominence and where the hardy fruits are grown so extensively for commercial purposes as in Idaho under both irrigated and non-irrigated conditions, any controllable factor which could possibly affect market values should be closely investigated. With the idea that there should be provided something tangible upon which comparisons between irrigated and non-irrigated fruits can be based and possibly upon which conclusions regarding quality reached, the analyses whose results are recorded on subsequent pages were undertaken.

RELATIVE AMOUNTS AND SIGNIFICANCE OF THE SEVERAL COMPOUNDS

By far the larger amount of any fruit is water; and to that portion of the fruit may be ascribed much of its value from a physiological standpoint. The solid or dry matter, that which remains after the water has been evaporated, consists of various compounds which for purposes of classification and study may be grouped first of all under two general terms, mineral or inorganic, and organic matter.

The mineral or inorganic portion, that which was contributed by the soil to the growth of the fruit, in comparison with the organic, is extremely small. As will be seen later, with apples and pears the weight of pure ash obtained by careful ignition, in no instance exceeded .30 per cent, and with pitted and small fruits, in no instance did that weight exceed .75 per cent of the weight of fresh, ripe fruit used for the determination. While there might be, because of radical differences in the chemical and physical properties of

the soils which are characteristic of the irrigated and the non-irrigated sections, appreciable differences in the percentage composition of the ashes, in the sum total of the mineral constituents, no material difference between irrigated and non-irrigated fruits is apparent.

The organic portion, that which gives to fruit its body, color, flavor, and odor, is a combination of various compounds, the nature of which permits of a classification into groups more or less distinctive in character: viz, acids, carbohydrates, coloring matter, essential oils, fats, nitrogenous bodies, and waxes. The several compounds which fall under one or another of the groups just mentioned, provide for the most part the basis upon which the most striking differences in composition can be shown; they will therefore be mentioned specifically before the analyses are presented in tabulated form.

Of the several commonly occurring fruit *acids*, malic is the predominating one in the apple, apricot, cherry, currant, gooseberry, peach, plum, and strawberry, but closely associated with it, especially in the currant and gooseberry, is citric acid. Tartaric acid is peculiar to the grape. It would seem from the pungency of these acids, that the ratio of acid to total sugar is a factor which must be taken into account in fixing responsibility for flavor. When recording the results of acid titrations, two courses were open: (1) To calculate them to percentages of the predominating acid, or (2) to percentage equivalents of a well known mineral acid. For purposes of comparison with results secured by others, the second course appeared to possess some advantages over the first and was therefore adopted. Acidity was calculated as sulphuric.

Of the *carbohydrates*, the sugars are the principal representatives in fully ripened fruits. In stone or pitted fruits, 35 to 60 percent; in apples, 55 to 65 percent; in pears, approximately 45 percent; and in small fruits, 30 to 40 percent of the dry matter is sugar. Ordinarily, in fruits three kinds of sugar may be looked for, viz: dextrose (grape sugar), levulose (fruit sugar), and sucrose (cane sugar). In these analyses dextrose and levulose were determined together and recorded in the tables as invert sugar. Sucrose was not found in all kinds of fruit examined and when found, as a rule, it was less than invert sugar in amount. The actual food value of the various fruits is largely dependent upon their total sugar content.

Certain definite compounds which are formed during growth and transported to the exterior cells during the ripening period constitute *coloring matter*. In comparison with other bodies they are always small in amount, but upon them certain fruits depend largely for that quality which is included under the term *attractiveness*.

The *essential oils* are likewise small in amount, but to them can be definitely traced those peculiarities of odor and flavor which in some varieties are very pronounced.

From some fruits, small amounts of *fat-like* substances can be isolated; they are believed to exert no appreciable influence upon the quality of those fruits in which they occur. *Wax-like* bodies are more common. In certain varieties of apples, an especially pronounced waxy coating is at least coincident with good keeping properties.

The *nitrogen compounds* are seemingly too small in amount to be considered a material addition to the nitrogenous portion of the daily diet, particularly if the fruits are served fresh. In fermentation processes, however, they are known to exert a very decided influence upon the quality of the final products.

ESSENTIAL DETERMINATIONS

In view of the large number of analyses that were thought necessary to arrive at definite conclusions regarding any decided differences in the composition of fruits grown with and without irrigation, the determination of all of the compounds just mentioned was practically impossible. In these analyses therefore, the determinations have been confined to those compounds and groups of compounds which are believed to exert a decided influence upon quality, and whose relative amounts are most subject to variation because of environmental or cultural conditions. Particular attention was given to the determination of water, total solids, sugars, and acids. It is believed that these determinations together with those of ash or mineral substance, coloring matter (as determined by observation), insoluble solids, and nitrogenous matter, will develop whatever material differences there may be in the composition of the most prominent fruits grown with and without irrigation.

METHODS OF ANALYSIS

A brief statement of methods adopted and adhered to throughout will be given for the benefit of those who may wish to compare these analyses with similar ones from other sources.

Total solids were determined by the combined use of the ordinary drying oven and the vacuum desiccator. This procedure was found necessary because of the comparatively large amounts of sugar present. That portion of the fruit which was selected for this determination was first cut into thin slices, then placed in the drying oven which was maintained at a temperature of 40-45 degrees centigrade, and kept there for a period of 24 hours. It was then re-

moved to the vacuum desiccator, where, in a vacuum of 20 or 22 inches, with concentrated sulphuric acid as the desiccating agent, it was brought to practically constant weight. The results are believed to be strictly comparable with those secured elsewhere by the use of the vacuum drying oven, but a point of greater importance is this: Thus secured they correctly indicate the percentage of total solids (and by difference the percentage of water) in the several kinds of fruit analyzed, and are therefore among themselves strictly comparable.

Acids and sugars were determined in aliquot portions of a solution obtained by digesting a weighed portion of the fruit (twice the normal weight for the Schmidt and Haensch polariscope) for several hours with successive portions of warm water. By comparison with slightly modified methods for acid determinations this procedure for acids was found to be perfectly reliable.

Invert and cane sugar were determined by the method of Fehling and by the use of Munson and Walker's modifications of the original Fehling solutions. In the conversion of weights of cuprous oxide to corresponding weights of invert sugar, Munson and Walker's tables were used. From the weight of digested residue dried to constant weight at 100° C. was secured the data necessary for the calculation of *insoluble solids*.

Nitrogen was determined by the Kjeldahl method on 10 to 12 gram portions of the fruit; *crude protein* by multiplying the nitrogen percentage by 6 $\frac{1}{4}$.

For the determination of *waste*, mechanical methods of necessity were resorted to. As the number of analyses grew this determination assumed an importance not at first assigned it. Although made by methods incapable of the same degree of accuracy as chemical methods, it should be noted that the determinations were invariably made by the same analyst, thereby eliminating what might have been a fruitful source of error. The significance of that portion of the tables in which percentages of waste are recorded will be made apparent later.

All analyses were made on fresh ripe fruits.

SECTIONS OF THE STATE REPRESENTED

Ada, Canyon, and Washington counties in South, and Nez Perce county in North Idaho are represented by irrigated samples of the 1910 and 1911 crops: Bonner, Kootenai, Latah, and Nez Perce counties in North Idaho by non-irrigated samples of the 1909, 1910, and 1911 crops. In this connection it should be particularly noted that no samples were secured from especially controlled conditions; all irrigated samples were grown in districts where climate and soil render irrigation imperative, all non-irrigated samples in

districts where the annual precipitation varies from 25 to 35 inches, and where the soil and topography of the country render irrigation method impracticable. The analyses therefore indicate the composition of *normal* irrigated and *normal* non-irrigated fruits. The leading commercial districts of the state are well represented. All samples were grown at elevations less than three thousand feet.

GROUPING OF RESULTS

In the tables the analyses have been grouped under three divisions, viz: drupaceous, pomaceous, and small fruits. In the original plans for the work, analyses were contemplated of only such varieties in each division as are common to both irrigated, and non-irrigated sections. It was soon discovered, however, that in each division certain varieties are very prominent in one section and practically unknown in another. To have included in the analyses only such varieties as are grown both with and without irrigation would therefore have eliminated from consideration, in each division, many prominent varieties whose composition for obvious reasons, in this connection, it is highly desirable to know. The scope of the work was then modified. Under each of the three divisions as many varieties as possible were secured for analysis, regardless of whether each would eventually be represented by both irrigated and non-irrigated samples. This fact accounts for the presence in the tables of many varieties whose analyses in this connection must be considered of secondary importance. Except for miscellaneous varieties of strawberries averages have been made for varieties only.

TABLE I—Continued—DRUPACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidity as H ₂ SO ₄	Crude protein Nx6%	Pure ash	Edible		Waste	
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent				percent	percent	Pits percent	Stems percent
								percent	percent					
CHERRIES—Continued.														
Late Duke—Irrigated	77.52	22.48	6.55	7.21	.23	7.44	.717	.919		90.17	8.22	1.61	9.83	
Late Duke—Non-Irrigated	74.33	25.67	7.80	10.90		10.90	.850	1.250						
Royal Ann—Irrigated	76.13	23.87	4.42	11.18		11.18	.427	1.037		91.53	6.68	1.79	8.47	
" 675	76.19	23.81	5.08	10.79		10.79	.630	.750		93.68	5.48	.84	6.32	
" 676	73.16	26.84	6.58	10.14		10.14	.717	1.450		93.36	5.93	.71	6.64	
" 677	74.65	25.35	5.71	11.07		11.07	.717	.763		92.62	6.71	.67	7.38	
" 678	75.74	24.26	5.29	10.68		10.68	.859	1.006		92.79	6.25	.96	7.21	
" 679	82.71	17.29	5.43	11.73		11.73	.858	.944		93.27	6.14	.59	6.73	
" 680	79.91	20.09	7.24	10.56		10.56	.858	.919		93.14	6.28	.58	6.86	
Average	76.93	23.07	5.68	10.88		10.88	.724	.981		92.91	6.21	.88	7.09	
Royal Ann—Non-Irrigated	73.07	26.93	4.73	13.00	.29	13.29	.660	1.250	.50					
No. 272	68.10	31.90	6.59	16.05		16.05	.730	1.250						
" 274	76.27	23.73	8.26	12.52		12.52	.544	1.400		86.73	11.67	1.60	13.27	
" 681	73.83	26.17	9.17	8.74	.25	8.99	.565	1.188		88.52	10.30	1.18	11.48	
" 682	72.82	27.18	7.19	12.58	.14	12.72	.625	1.272		87.62	10.99	1.39	12.38	
Average	73.67	26.33	5.50	11.61		11.61	.731	1.013		89.64	7.00	3.36	10.36	
Miscellaneous—Irrigated	83.70	16.30	4.92	6.46		6.46	.668	1.281						
No. 411 Dyehouse														
" 380 Early Richmond														

TABLE I—Continued—DRUPACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄		Crude protein Nx6 $\frac{1}{4}$		Pure ash		Edible		Waste	
	percent	percent	Total	Insolu- ble	Invert	Cane	Total	percent	percent	percent	percent	percent	percent	percent	percent	Stems	Total
CHERRIES—Continued.																	
Miscellaneous—Irrigated																	
No. 390 Early	76.75	23.25	4.33	9.58			9.58	.550	1.150			87.67	10.65	1.68	12.33		
" 394 Early Sweet	79.49	20.51	8.04	8.39			8.39	.645	.975			87.09	10.76	2.15	12.91		
" 395 Early Pie	80.17	19.83	6.52	7.44			7.44	.851	1.069			84.55	12.72	2.73	15.45		
" 396 Early Pie	74.47	25.53	10.37	8.93			8.93	.179	.781			82.02	15.77	2.21	17.98		
" 408 English Morello	71.67	28.33	8.29	10.27			10.27	.639	1.281			87.64	10.85	1.51	12.36		
" 686 Lambert	72.77	27.23	8.72	9.81			9.81	.539	.738			93.86	5.42	.72	6.14		
" 437 Suda	77.79	22.21	7.35	8.92			8.92	1.000	.875			89.02	8.54	2.44	10.98		
" 413 Wilson	71.26	28.74	8.38	11.79			11.79	.621	1.287			87.28	9.96	2.76	12.72		
Miscellaneous—Non-Irrigated																	
No. 285 Late Pie	74.14	25.86	8.19	8.28			8.28	1.150	1.310								
" 270 May Duke	79.26	20.74	5.82	8.18			8.18	.980	1.000								
" 268 Sour	73.95	26.05	5.23	9.83			9.83	1.190	1.440		.61						
" 281 Sour	77.37	22.63	7.35	8.32			.13	1.070	1.310								
Average	75.66	24.34	6.29	9.08			.07	1.130	1.380								
NECTARINES—Irrigated																	
No. 456	76.93	23.07	2.28	2.68			7.68	10.36	.694	.356			86.54	7.22	6.24	13.46	
" 474	74.81	25.19	4.09	2.21			7.06	9.27	.987	.519			86.48	8.68	4.84	13.52	
Average	75.87	24.13	3.69	2.45			7.37	9.82	.841	.438			86.51	7.95	5.54	13.49	

TABLE I—Continued — DRUPACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein Nx6¼	Pure ash		Edible		Waste		
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent			percent	percent	Pits percent	Skins percent	Total percent		
								percent	percent							
PEACHES																
Champion—Irrigated																
No. 467	76.90	23.10	2.98	2.57	10.00	12.57	.550	.306	90.02	4.73	5.25	9.98				
" 468	82.03	17.97	2.08	2.54	8.89	11.43	.330	.237	87.48	5.21	7.31	12.52				
" 476	86.79	13.21	2.89	1.11	5.43	6.54	.485	.825	88.43	6.03	5.54	11.57				
Average	81.91	18.09	2.65	2.07	8.11	10.18	.455	.456	88.64	5.32	6.04	11.36				
Early Alexander—Irrigated																
No. 425	87.17	12.83	.97	1.92	7.11	9.03	.304	.662	88.74	7.04	4.22	11.26				
" 436	85.12	14.88	2.16	2.38	6.92	9.30	.308	.706	85.17	8.90	5.93	14.83				
Average	86.15	13.85	1.52	2.15	7.02	9.17	.306	.684	86.96	7.97	5.07	13.04				
Early Crawford—Irrigated																
No. 465	85.32	14.68	1.66	1.07	7.92	8.99	.363	.452	91.36	6.08	2.56	8.64				
" 466	83.77	16.23	1.92	1.40	8.33	9.73	.702	.516	89.67	5.57	4.76	10.33				
" 472	83.62	16.38	2.83	1.78	7.81	9.59	.653	.863	85.92	8.00	6.08	14.08				
Average	84.24	15.76	2.17	1.42	8.02	9.44	.573	.610	88.98	6.56	4.46	11.02				
Early Crawford—Non-Irrigated																
No. 283	83.60	16.40	2.06	2.34	8.34	10.68	.640	.690	7.45							
Early—Non-Irrigated	87.91	12.09	2.20	2.11	4.83	6.94	.700	.460	7.78							
No 276	83.85	16.15	2.00	1.90	7.58	9.48	.614	.400	89.58	6.31	4.11	10.42				
Elberta—Irrigated	84.49	15.51	1.81	1.97	6.88	8.85	.373	.800	84.98	8.73	6.29	15.02				
No. 475	84.68	15.32	1.91	1.94	7.23	9.17	.494	.600	87.28	7.52	5.20	12.72				
" 477																
Average																

TABLE I—Continued—DRUPACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty % H ₂ SO ₄	Crude protein Nx6½/4	Pure ash	Edible percent	Waste		
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	Pits percent					Skins percent	Total percent	
								percent	percent					
PEACHES—Continued														
Hale's Early—Irrigated No. 453	88.73	11.27	1.83	2.13	4.28	6.41	.255	.463			81.78	11.35	6.87	18.22
Sneed—Irrigated No. 414	84.86	15.14	1.40	3.34	4.49	7.83	.452	.556			81.34	13.74	4.92	18.66
Salway—Non-Irrigated No. 291	85.80	14.20	1.22			3.81	.500	.460	.45		91.00			9.00
Yellow Crawford—Irrigated No. 451	85.13	14.87	2.57	1.81	5.26	7.07	1.110	.788				9.68		
" " 455	84.98	15.02	1.96	1.97	7.58	9.55	.523	.225			89.52	7.54	2.94	10.48
Average	85.06	14.94	2.27	1.89	6.42	8.31	.817	.507				8.27		
White Malta—Non-Irrigated No. 290	86.66	13.34	1.26			4.10	.420	1.000			87.75			12.25

TABLE I—Continued—DRUPACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein N x 6 1/4	Pure ash	Edible		Waste	
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent				percent	percent	percent	Pits percent
								percent	percent					
PLUMS														
Bradshaw—-Irrigated														
No. 450	77.43	22.57	3.72	4.68	2.40	7.08	.379	.887			80.34	7.88	11.78	19.66
" 458	79.90	20.10	2.46	4.00	4.13	8.13	.906	.706			89.12	4.09	6.79	10.88
" 459	78.47	21.53	3.04	3.48	4.94	8.42	.570	.750			81.49	4.71	13.80	18.51
" 460	85.16	14.84	1.74	2.51	6.19	8.69	.756	.425			88.36	4.55	7.09	11.64
" 461	85.23	14.77	2.15	1.58	4.48	6.06	.663	.475			89.30	4.93	5.77	10.70
" 464	83.09	16.91	1.77	3.15	7.79	10.94	.583	.487			87.96	4.55	7.49	12.04
Average	81.55	18.45	2.48	3.23	4.99	8.22	.643	.622			86.09	5.12	8.79	13.91
Green Gage—-Irrigated														
No. 462	83.86	16.14	1.72	2.28	5.50	7.78	.654	.391			87.57	4.75	7.68	12.43
Green Gage—Non-Irrigated														
No. 292	83.22	16.78	1.20			4.10	1.120	.630			77.75			22.25
" 303	86.39	13.61	1.41	4.10	2.57	6.57	1.070	.690			76.97			23.03
Average	84.82	15.18	1.31			5.34	1.100	.660			77.36			22.64
Japanese—-Irrigated														
No. 454	82.04	17.96	2.86	3.47	6.38	9.85	.352	.356			84.61	5.44	9.95	15.39
Peach—-Irrigated														
No. 434	80.47	19.53	1.80	3.43	5.09	8.42	.692	.519			86.30	3.11	10.59	13.70
" 444	81.96	18.04	1.62	3.80	6.36	10.16	.450	.637			86.37	2.40	11.23	13.63
" 449	84.42	15.58	1.94	3.20	4.19	7.39	.529	.513			85.57	3.15	11.28	14.43
Average	82.28	17.72	1.79	3.48	5.21	8.69	.557	.556			86.08	2.89	11.03	13.92

TABLE I—Continued—DRUPACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidity as H ₂ SO ₄	Crude protein Nx6%	Pure ash	Edible	Waste	
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	Pits percent					Skins percent	Total percent
								percent	percent				
PLUMS—Continued													
Peach—Non-Irrigated													
No. 286	83.95	16.05	.99	2.38	7.12	9.50	.970	.690		87.96			12.04
" 288	85.44	14.56	.96	4.78	5.47	10.25	.760	1.060		86.66			13.34
" 289	85.40	14.60	1.45	2.30	4.70	7.00	.750	.750		82.99			17.01
Average	84.93	15.07	1.13	3.15	5.76	8.91	.830	.830		85.87			14.13
Small Red—Irrigated													
No. 445	81.90	18.10	7.76	2.40	7.51	9.91	.857	.340		90.67	3.59	5.74	9.33
" 452	79.48	20.52	7.38	5.00		5.00	1.800	.913			5.30		
PRUNES													
Hungarian—Irrigated													
No. 480	81.06	18.94	3.04	1.13	5.61	6.74	1.470	.394	.31	83.08	5.72	11.20	16.92
" 484	83.86	16.14	2.18	1.12	6.77	7.89	1.240	.344		84.29	4.91	10.80	15.71
" 489	80.54	19.46	1.94	2.03	8.71	10.74	1.280	.697		84.30	4.87	10.83	15.70
" 694	82.23	17.77	2.69	1.90	5.45	7.35	1.564	.625			1.95		
" 695	83.15	16.85	3.05	1.51	4.23	5.74	1.253	.375			3.88		
Average	82.17	17.83	2.70	1.54	6.15	7.69	1.361	.487		83.89		10.94	16.11
Hungarian—Non-Irrigated													
No. 297	82.55	17.45	1.52	2.07	8.92	10.99	1.450	.750		77.48			22.52
" 705	79.87	20.13	1.97	.83	4.49	5.32	1.490	.625			10.94		
Average	81.21	18.79	1.75	1.45	6.71	8.16	1.470	.688					

TABLE I—Continued—DRUPACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidity as H ₂ SO ₄	Crude protein Nx6 $\frac{1}{4}$	Pure ash	Edible		Waste		
	percent	percent	Total	Insoluble	Invert	Cane	Total				percent	percent	percent	percent	Fits
								percent	percent	percent					
PRUNES—Continued															
Italian—Irrigated															
No. 481	80.27	19.73	2.99		4.11	3.96	8.07	.874	1.175	.40	94.99	5.01			5.01
" 485	76.73	23.27	3.22		4.67	3.97	8.64	.850	.656		94.43	5.57			5.57
" 488	78.71	21.29	3.53		4.29	4.10	8.39	.762	.538		95.12	4.88			4.88
" 691	79.86	20.14	2.90		4.05	3.04	7.09	.764	.469		97.66	2.34			2.34
" 692	80.44	19.56	3.43		4.66	2.83	7.49	.717	.963		95.02	4.98			4.98
" 693	81.34	18.66	2.30		2.45	3.61	6.06	1.093	1.513		96.72	3.28			3.28
Average	79.56	20.44	3.06		4.04	3.58	7.62	.843	.886		95.66	4.34			4.34
Italian—Non-Irrigated															
No. 293	77.51	22.49	2.61		4.16	6.45	10.61	.750	.500		94.04	5.96			5.96
" 294	78.63	21.37	2.20		4.12	5.91	10.03	.820	.820		93.93	6.07			6.07
" 304	74.37	25.63	2.09		6.25	8.11	14.36	.670	.690		93.80	6.20			6.20
" 299	78.32	21.68	2.23		4.40	5.30	9.70	1.100	1.190		92.90	7.10			7.10
" 300	80.62	19.38	1.49		3.88	8.09	11.97	.740	.560						
" 697	73.23	26.77	2.48		6.51	4.76	11.27	1.260	1.050		93.96	6.04			6.04
" 698	66.69	33.31	5.20		7.91	6.73	14.64	1.050	.894		93.54	6.46			6.46
" 699	69.40	30.60	5.29		6.72	5.63	12.35	1.090	1.388		91.69	8.31			8.31
" 700	71.67	28.33	3.95		4.98	8.61	13.59	1.040	1.013		92.08	7.92			7.92
" 701	67.59	32.41	5.03		7.17	8.87	16.04	.929	.881		92.13	7.87			7.87
" 702	78.19	21.81	5.43		5.02	5.13	10.15	.976	1.694		92.13	7.87			7.87
" 703	70.56	29.44	5.70		7.91	8.68	16.59	.952	1.269		92.79	7.21			7.21
Average	73.90	26.10	3.64		5.75	6.86	12.61	.948	.996		93.00	7.00			7.00

TABLE I—Continued—DRUPACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty H ₂ SO ₄	Crude protein Nx ^{3/4}	Pure ash	Edible		Waste				
	percent	percent	Total	Insolu- ble	Invert	Cane	Total				percent	percent	percent	percent	Pits	Skins	Total
								percent	percent								
PRUNES—Continued																	
Petite—Irrigated																	
No. 463	76.85	23.15	4.94	3.80	4.34	8.14	.401	.606			91.45	8.55				8.55	
" 486	74.69	25.31	3.76	5.10	4.39	9.49	.341	.519			63.65	6.35				6.35	
" 696	70.81	29.19	5.54	6.28	3.24	9.52	.341	.844			92.20	7.80				7.80	
Average	74.12	25.18	4.75	5.06	3.99	9.05	.361	.656			92.43	7.57				7.57	
Petite—Non-Irrigated																	
No. 298	73.02	26.98	3.62	6.23	9.25	15.48	.550	1.000			91.05	8.95				8.95	
" 704	73.51	26.49	3.26	5.25	8.45	13.70	.552	.850			91.94	8.06				8.06	
Average	73.27	26.73	3.44	5.74	8.85	14.59	.551	.925			91.50	8.50				8.50	
Prunus Simonii—Irrigated																	
No. 443	79.90	20.10	2.37	2.84	6.90	9.74	.980	1.006			92.52	2.26				5.22	7.48
Silver—Irrigated																	
No. 450a	75.47	24.53	2.63	5.98	6.43	12.41	.411	.531			84.26	4.63				11.11	15.74

TABLE II—DRUPACEOUS FRUITS

INSOLUBLE SOLIDS, SUGAR, ACID, AND CRUDE PROTEIN CALCULATED ON AVERAGE CONTENT OF DRY MATTER.

Fruit and variety	Number of analyses	Insoluble solids percent	Sugar total percent	Acid as H ₂ SO ₄ percent	Crude protein N x 6 1/4 percent
APRICOTS					
Moorpark—Irrigated	1	9.89	65.36	3.13	5.32
CHERRIES					
Bing—Irrigated	3	30.80	49.10	3.48	4.48
Bing—Non-Irrigated	3	37.87	53.08	2.55	5.57
Black Republican—Irrigated	2	23.55	37.74	.73	3.88
“ “—Non-Irrigated	3	30.15	39.86	1.45	4.47
Late Duke—Irrigated	1	29.14	33.10	3.19	4.08
“ “—Non-Irrigated	1	30.39	42.46	3.31	4.86
Royal Ann—Irrigated	7	24.62	47.16	3.13	4.25
“ “—Non-Irrigated	4	26.45	46.80	2.30	4.67
Sour—Non-Irrigated	2	25.84	37.60	4.64	5.67
NECTARINES—Irrigated	2	15.29	40.70	3.48	1.81
PEACHES					
Champion—Irrigated	3	14.65	56.28	2.51	2.52
Early Alexander—Irrigated	2	10.97	66.21	2.21	4.94
“ Crawford—Irrigated	3	13.76	59.91	3.63	3.87
“ “—Non-Irrigated	1	12.56	65.12	3.90	4.21
Elberta—Irrigated	2	12.47	59.85	3.30	3.91
Yellow Crawford—Irrigated	2	15.20	55.62	5.47	3.39
PLUMS					
Bradshaw—Irrigated	6	13.44	44.55	3.48	3.37
Green Gage “	1	10.66	48.20	4.05	2.42
“ “—Non-Irrigated	2	8.63	35.17	7.24	4.34
Peach—Irrigated	3	10.10	49.04	3.14	3.14
“ “—Non-Irrigated	3	7.50	59.14	5.50	5.50
PRUNES					
Hungarian—Irrigated	5	15.15	43.13	7.63	2.73
“ “—Non-Irrigated	2	9.31	43.43	7.82	3.66
Italian—Irrigated	6	14.97	37.28	4.12	4.34
“ “—Non-Irrigated	12	13.95	48.31	3.63	3.81
Petite—Irrigated	3	18.36	34.97	1.39	2.53
“ “—Non-Irrigated	2	12.87	54.58	2.06	3.46

Cherries: In explanation of the comparatively high percentages of insoluble solids which have been recorded for cherries in the preceding tables, it should be said that for cherries the whole fruit, while for all other fruits in this division^a, the whole fruit exclusive of the pit was used for analysis.

The Bing, Black Republican, Late Duke, and Royal Ann are the only varieties found growing under both irrigated and non-irrigated conditions; they, together with the Lambert, are the most prominent commercial varieties. With one exception (Black Republican) the irrigated cherries contained less dry matter (total solids), insoluble solids, and sugar than did non-irrigated ones of the same varieties. In acid content the samples of irrigated Bings and Royal Anns were higher, those of Black Republican, and Late Duke lower than were the samples of non-irrigated cherries of corresponding varieties. All varieties when grown with irrigation were decidedly lower in crude protein than when grown without. With the exception of sugar in irrigated Royal Anns, the same statements will hold for sugar, acid, and crude protein calculated to the dry matter.

Peaches: Only one variety of peach, Early Crawford, was secured from both irrigated and non-irrigated sections. The irrigated samples contained less dry matter, sugar, acid, and crude protein, but slightly more insoluble solids than the non-irrigated one. When calculated to the dry matter the acid content of the irrigated samples was slightly higher than that of the non-irrigated one.

Plums: Of the several commercial varieties of plums only those known as Green Gage, and Peach were found growing under both irrigated and non-irrigated conditions. Irrigated samples of both varieties contained more dry matter and insoluble solids than did corresponding samples grown without irrigation. In sugar the one sample of Green Gage grown with irrigation was decidedly richer than the samples grown without irrigation. In acid, and crude protein all samples of both varieties grown with irrigation were lower than those grown without.

Prunes: Three commercial varieties of prunes common to both irrigated and non-irrigated sections were found. The average sample grown with

a Except Japanese plum No. 454 and Small Red plum No. 402.

irrigation contained the smaller percentage of dry matter, sugar, acid, and crude protein. Differences were not pronounced in the Hungarian and Petite varieties, but were decidedly so, especially in the sugar content, of the more commonly grown Italian.

In the preceding tables differences in composition are not sufficiently pronounced to enable one to draw sweeping general conclusions. This, however, may be said: In spite of prominent exceptions there is a fairly well defined tendency with this class of fruits when grown in the non-irrigated sections to elaborate more dry matter (total solids), more sugar, more acid, and more crude protein, than when grown in the irrigated sections. Differences in sugar, acid, and crude protein are more pronounced when calculated to the dry matter. As most of the fruits mentioned are marketed and consumed in the fresh condition, the comparatively slight differences in composition noted from results recorded in Table I are not likely to be detected by the taste of the average consumer.

WASTE.

On cherries, pits and stems; on peaches, plums, and Hungarian prunes, pits and skins; and on Italian and Petite prunes, pits only were considered waste. It is evident from Table I that waste on drupaceous fruits varies considerably with the several kinds. To a less extent it varies also with varieties, but within any one variety waste is fairly constant for either irrigated or non-irrigated fruits, but not for both. Apparently, the earlier the variety, the greater the waste. Of the several kinds of fruit the greatest waste was found on plums and the closely related Hungarian prune. The waste on all drupaceous fruits is decidedly appreciable.

Wherever comparisons could be made by varieties the advantage was so clearly in favor of the samples which were grown with irrigation that it is safe to conclude that as a rule with drupaceous fruits the greater waste attaches to those grown under non-irrigated conditions,

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein Nx6½	Pure ash	Edible		Waste			
	percent	percent	Total	Insolu- ble	Invert	Cane	Total				percent	percent	percent	percent	Skins	Core
								percent	percent							
APPLES—Continued																
Arkansas Black—Irrigated																
No. 596	81.82	18.18	3.42		7.86	3.26	11.12	.327	.319		93.62	4.19	2.19	6.38		
" 597	80.87	19.13	3.19		7.33	3.92	11.25	.276	.225		92.04	5.13	2.83	7.96		
Average	81.59	18.41	3.02		7.58	4.04	11.61	.344	.245		91.49	5.76	2.75	8.51		
Arkansas Black—Non-Irr.																
No. 706	80.13	19.87	4.01		6.70	5.30	12.00	.119	.248		89.45	6.01	4.54	10.55		
" 707	88.14	11.86	3.79		7.80	4.94	12.74	.327	.369		89.38	6.56	4.06	10.62		
" 708	81.48	18.52	3.95		6.39	5.03	11.42	.345	.288		88.78	6.65	4.57	11.22		
" 709	79.46	20.54	3.47		9.00	3.98	12.98	.334	.388		90.88	5.59	3.53	9.12		
" 710	81.10	18.90	3.15		7.55	4.71	12.26	.315	.406		90.65	5.69	3.66	9.35		
" 711	79.52	20.48	3.45		6.97	5.21	12.18	.393	.344		90.99	5.68	3.33	9.01		
Average	81.64	18.36	3.64		7.40	4.86	12.26	.306	.361		90.02	6.03	3.95	9.98		
Ben Davis—Irrigated																
No. 635	82.93	17.07	4.12		6.18	3.52	9.70	.299	.169		87.89	6.99	5.12	12.11		
" 636	83.58	16.42	3.34		6.21	3.43	9.64	.256	.185		87.55	6.97	5.48	12.45		
" 637	83.81	16.19	3.20		6.60	3.06	9.66	.285	.194		88.11	6.81	5.08	11.89		
" 644	83.94	16.06	2.75		7.46	3.82	11.28	.223	.194		87.25	7.11	5.64	12.75		
" 645	83.74	16.26	3.59		6.66	3.34	10.00	.280	.181		88.56	6.33	5.11	11.44		
" 646	84.21	15.79	3.01		6.59	3.34	9.93	.317	.169		87.25	6.83	5.92	12.75		
Average	83.70	16.30	3.34		6.62	3.42	10.04	.277	.182		87.77	6.84	5.39	12.23		

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein Nx6%	Pure ash	Edible	Waste		
	percent	percent	Total	Insolu- ble	Invert	Cane	Total					percent	percent	percent
								percent	percent	percent	percent			
APPLES—Continued														
Ben Davis—Irrigated														
No. 586	83.30	16.70	3.05	5.62	4.57	10.19	.317	.169		91.69	5.59	2.72	8.31	
General Average														
Ben Davis—Non-Irrigated														
No. 318	83.64	16.36	3.30	6.48	3.58	10.06	.283	.179		88.33	6.66	5.01	11.67	
Ben Davis—Non-Irrigated														
No. 557	82.05	17.95	4.16	6.34	2.46	8.80	.180	.630		79.62			20.38	
" 558	79.10	20.90	4.94	7.42	4.39	11.81	.383	.231		86.53	7.85	5.62	13.47	
" 559	78.25	21.75	5.01	9.44	3.56	13.00	.341	.356		86.22	7.82	5.96	13.78	
" 560	78.41	21.59	5.27	7.74	4.60	12.34	.409	.318		82.73	8.81	8.46	17.27	
" 561	80.16	19.84	4.22	7.78	4.01	11.79	.352	.275		86.73	6.98	6.29	13.27	
" 562	80.14	19.86	4.71	7.57	3.90	11.47	.310	.331		83.74	9.61	6.65	16.26	
" 563	78.24	21.76	4.97	8.14	2.87	11.01	.360	.481		82.40	9.44	8.16	17.60	
" 564	80.50	19.50	5.06	6.92	4.57	11.49	.355	.367		83.45	9.60	6.95	16.55	
Average	78.29	21.71	5.17	8.83	3.91	12.74	.357	.394		82.32	9.37	8.31	17.68	
Ben Davis—Non Irrigated	79.14	20.86	4.92	7.98	3.98	11.96	.358	.344		84.26	8.69	7.05	15.74	
No. 573	83.40	16.60	3.62	7.53	2.97	10.50	.237	.263		87.76	6.89	5.35	12.24	
" 574	83.75	16.25	3.64	7.40	2.57	9.97	.191	.287		86.49	7.67	5.84	13.51	
" 575	83.02	16.98	4.21	7.01	2.83	9.84	.280	.344		86.83	8.64	4.53	13.17	
" 576	83.20	16.80	3.38	7.09	3.14	10.23	.252	.271		85.97	8.08	5.95	14.03	
" 577	82.76	17.24	3.05	7.53	2.65	10.18	.214	.281		85.50	7.34	7.16	14.50	

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidity as H ₂ SO ₄		Crude protein Nx6 $\frac{1}{4}$		Pure ash		Edible		Waste		
	percent	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent	percent	percent	percent	percent	percent	percent	Skins percent	Core percent	Total percent	
																		percent
APPLES—Continued																		
Ben Davis—Non-Irrigated																		
No. 578	83.52	16.48	3.98		7.33	2.87	10.20	.162	.294					85.15	8.89	5.96	14.85	
" 579	83.42	16.58			7.45	3.42	10.87	.256	.275					84.81	9.61	5.58	15.19	
" 580	84.00	16.00			7.25	3.30	10.55	.252	.288					87.06	8.58	4.36	12.94	
Average	83.38	16.62	3.64		7.33	2.97	10.30	.231	.288					86.20	8.21	5.59	13.80	
General Average	81.31	18.69	4.27		7.58	3.42	11.00	.288	.334					85.3	8.45	6.32	14.77	
Gano—Irrigated																		
No. 632	84.04	15.96	2.89		6.50	3.53	10.03	.308	.150					84.35	9.26	6.39	15.65	
" 633	84.67	15.33	3.01		6.70	3.56	10.26	.313	.137					89.05	6.29	4.66	10.95	
" 634	83.24	16.76	2.87		6.33	3.91	10.24	.327	.162					88.42	6.42	5.16	11.58	
Average	83.98	16.02	2.92		6.51	3.67	10.18	.316	.150					87.27	7.32	5.40	12.73	
Gano—Non-Irrigated																		
No. 319	81.48	18.52	4.34		6.06	3.13	9.19	.150	.500			.22		81.16			18.84	
Gano—Non-Irrigated																		
No. 545	82.60	17.40	3.68		6.52	4.22	10.74	.343	.237					84.88	9.62	5.50	15.12	
" 546	80.71	19.29	3.63		7.02	4.46	11.48	.395	.256					86.65	8.25	5.10	13.35	
" 547	81.43	18.57	3.88		5.92	4.54	10.46	.358	.225					85.89	8.80	5.31	14.11	
" 548	78.97	21.03	4.10		9.18	3.94	13.12	.346	.319					84.76	9.47	5.77	15.24	
Average	80.93	19.07	3.82		7.16	4.29	11.45	.360	.259					85.55	9.03	5.42	14.45	
Gano—Non-Irrigated																		
No. 549	80.98	19.02	3.66		7.04	4.02	11.06	.250	.237					86.91	5.65	7.44	13.09	

IDAHO EXPERIMENT STATION

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein Nx% ^a	Pure ash	Edible		Waste		
	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent	percent				percent	percent	Skins percent	Core percent	Total percent
								percent	percent						
APPLES—Continued															
Gano—Non-Irrigated															
No. 550	83.00	17.00	3.83		6.63	4.52	11.15	.303	.287		86.91	7.07	6.02	13.09	
" 551	83.44	16.56	3.93		7.20	2.69	9.89	.213	.300		85.69	8.21	6.10	14.31	
" 552	83.24	16.76	3.51		6.36	3.46	9.82	.237	.331		85.59	8.00	6.41	14.41	
" 553	82.78	17.22	3.65		7.78	3.34	11.12	.191	.344		87.50	6.75	5.75	12.50	
" 554	82.67	17.33	3.64		7.73	3.77	11.50	.191	.344		88.56	6.69	4.75	11.44	
" 555	82.27	17.73	4.04		7.38	3.64	11.02	.221	.312		85.97	7.83	6.20	14.03	
" 556	82.35	17.65	3.62		7.55	3.54	11.09	.195	.400		85.99	8.12	5.89	14.01	
Average	82.59	17.41	3.74		7.21	3.62	10.83	.225	.319		86.64	7.29	6.07	13.36	
Gano—Non-Irrigated															
No. 565	84.52	15.48	2.99		6.98	3.46	10.44	.237	.269		89.89	5.39	4.72	10.11	
" 566	83.32	16.68	3.42		7.22	4.10	11.32	.326	.262		88.95	5.88	5.17	11.05	
" 567	83.74	16.26	3.25		7.08	3.55	10.63	.256	.335		88.38	7.40	4.22	11.62	
" 568	81.86	18.14	3.37		7.05	4.71	11.76	.284	.263		87.72	7.01	5.27	12.28	
" 569	83.37	16.63	3.48		6.99	2.54	9.53	.303	.319						
" 570	83.72	16.28	3.03		6.62	3.54	10.16	.242	.131						
" 571	81.30	18.70	3.21		7.70	3.84	11.54	.233	.150		87.44	6.43	6.13	12.56	
" 572	84.27	15.73	2.98		6.94	3.11	10.05	.280	.344		87.70	7.28	5.02	12.30	
Average	83.26	16.74	3.22		7.07	3.61	10.68	.270	.259		88.35	6.56	5.09	11.65	
General Average	82.48	17.52	3.58		7.09	3.72	10.81	.264	.293		86.96	7.43	5.60	13.03	
Grimes Golden—Irrigated															
No. 456a	79.89	20.11	2.70		6.15	6.10	12.25	.322	.194		84.95	9.95	5.10	15.05	

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein Nx6½	Pure ash	Edible	Waste	
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent					percent	percent
								percent	percent				
APPLES—Continued													
Grimes Golden—Non-Irrigated													
No. 712	83.03	16.97	2.73	5.80	3.33	9.13	3.54	.238		91.42	5.67	2.91	8.58
" 713	82.16	17.84	3.27	6.47	6.38	12.85	4.05	.269		88.90	5.68	5.42	11.10
" 714	84.32	15.68	3.23	5.48	5.79	11.27	4.01	.244		88.10	6.48	5.42	11.90
" 715	82.13	17.87	3.14	5.74	5.66	11.40	4.14	.238		89.76	5.80	4.44	10.24
Average	82.91	17.09	3.09	5.87	5.29	11.16	3.94	.247		89.54	5.91	4.55	10.46
Jonathan—Irrigated.													
No. 457a	83.30	16.70	2.52	6.42	4.61	11.03	3.90	.262		84.11	11.60	4.29	15.89
" 458a	83.05	16.95	2.43	6.90	3.87	10.77	4.30	.281		88.68	7.10	4.22	11.32
" 459a	82.47	17.53	2.28	6.93	3.92	10.85	3.95	.213		89.56	5.65	4.79	10.44
" 460a	82.03	17.97	2.54	7.10	4.35	11.45	3.76	.175				4.68	
" 461a	82.76	17.24	2.60	6.90	4.01	10.91	4.04	.219		89.97	6.31	3.72	10.03
" 462a	84.23	15.77	2.34	6.77	3.64	10.41	3.96	.169		88.86	6.21	4.93	11.14
" 463a	81.85	18.15	2.39	6.69	3.81	10.50	4.44	.194		88.78	6.65	4.57	11.22
" 464a	81.79	18.21	2.55	7.16	3.93	11.09	4.45	.187		88.15	6.25	5.60	11.85
Average	82.68	17.32	2.46	6.86	4.02	10.88	4.10	.213		88.30	7.10	4.60	11.70
Jonathan—Irrigated													
No. 465a	82.24	17.76	2.40	7.80	3.04	10.84	4.10	.231		88.80	7.09	4.11	11.20
" 466a	82.76	17.24	2.67	7.72	3.51	11.23	3.92	.219		90.58	5.84	3.58	9.42
" 467a	80.90	19.10	2.58	8.00	3.35	11.35	3.47	.200		88.47	6.87	4.66	11.53
" 468a	82.53	17.47	2.61	8.27	3.66	11.93	3.39	.169		85.56	8.83	5.61	14.44
" 469a	84.41	15.59	2.26	8.23	2.60	10.83	3.45	.225		88.18	7.45	4.37	11.82

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidity as H ₂ SO ₄		Crude protein N×6%		Pure ash		Edible		Waste	
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent	percent	percent	percent	percent	percent	percent	Skins percent	Core percent	Total percent	
																	percent
APPLES—Continued																	
Jonathan—Irrigated																	
No. 470a	84.06	15.94	2.38	8.21	2.95	11.16	.380	.269	88.72	6.79	4.49	11.28					
" 471a	81.61	18.39	2.68	8.78	3.64	12.42	.417	.206	91.26	5.21	3.53	8.74					
" 472a	80.91	19.09	2.82	8.50	3.63	12.13	.511	.156	89.72	6.14	4.14	10.28					
Average	82.43	17.57	2.55	8.19	3.30	11.49	.393	.209	88.91	6.78	4.31	11.09					
Jonathan—Irrigated																	
No. 473a	82.57	17.43	2.63	8.01	3.14	11.15	.637	.144	.22	87.96	6.68	5.36	12.04				
" 474a	82.78	17.22	2.44	8.60	2.68	11.28	.572	.131	88.39	6.90	4.71	11.61					
" 475a	81.92	18.08	2.34	8.49	2.58	11.07	.394	.175	87.99	6.75	5.26	12.01					
" 476a	84.34	15.66	2.20	7.44	2.76	10.20	.367	.165	87.24	7.17	5.59	12.76					
" 477a	82.80	17.20	2.50	9.13	2.24	11.37	.400	.156	88.15	6.56	5.29	11.85					
" 478a	80.55	19.45	2.73	8.32	3.18	11.50	.477	.181	90.27	5.82	3.91	9.73					
" 479a	81.20	18.80	2.54	8.93	3.17	12.10	.440	.169	86.16	7.56	6.28	13.84					
" 480a	82.90	17.10	2.36	8.32	2.85	11.17	.351	.162	85.96	7.60	6.44	14.04					
Average	82.38	17.62	2.47	8.41	2.82	11.23	.455	.160	87.76	6.88	5.36	12.24					
Jonathan—Irrigated																	
No. 517	84.81	15.19	2.28	7.37	3.27	10.64	.337	.163	89.64	5.50	4.86	10.36					
" 518	83.93	16.07	1.99	8.43	2.25	10.68	.240	.275	88.73	5.94	5.33	11.27					
" 519	82.37	17.63	2.01	8.79	1.81	10.60	.300	.154									
" 520	84.53	15.47	2.19	7.13	2.99	10.12	.302	.163	87.15	6.47	6.38	12.85					
" 521	80.66	19.34	2.26	8.85	3.29	12.14	.380	.213	88.74	6.55	4.71	11.26					

TABLE III—Continued — POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein N×6%	Pure ash	Edible		Waste		
	percent	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent				percent	percent	percent	percent	Skins percent
								percent	percent						
APPLES—Continued															
Jonathan—Irrigated	83.54	16.46	2.08		7.22	3.88	11.10	.302	.256		90.68	5.06	4.26	9.32	
Average	83.31	16.69	2.14		7.97	2.91	10.88	.310	.204		88.99	5.90	5.11	11.01	
Jonathan—Irrigated	81.92	18.08	2.69		8.02	3.37	11.39	.487	.375		89.43	7.07	3.50	10.57	
" 582	83.15	16.85	2.31		7.62	2.57	10.19	.352	.262		89.39	7.44	3.27	10.71	
" 583	83.26	16.74	2.34		6.35	4.23	10.58	.383	.225		89.38	7.04	3.58	10.62	
Average	82.78	19.22	2.45		7.33	3.39	10.72	.407	.287		89.37	7.18	3.45	10.63	
General Average	82.67	17.33	2.42		7.80	3.30	11.10	.398	.204		88.53	6.78	4.69	11.47	
Jonathan—Non-Irrigated	82.46	17.54	1.91		7.56	3.60	11.16	.570	.310	.21	85.88			14.12	
No. 313															
Jonathan—Non-Irrigated	83.81	16.19	2.16		7.42	3.13	10.55	.286	.188		87.02	6.79	6.19	12.98	
" 498	85.08	14.92	2.23		7.19	2.13	9.32	.340	.194		85.74	7.17	7.09	14.26	
" 499	84.18	15.82	2.25		6.85	3.52	10.37	.423	.212		86.68	7.37	5.95	13.32	
" 500	83.88	16.12	2.41		7.84	4.23	12.07	.428	.282		85.75	8.70	5.55	14.25	
" 501	84.64	15.36	2.57		7.34	3.48	10.82	.341	.212		87.52	6.76	5.72	12.48	
" 502	84.28	15.72	2.35		6.69	2.75	9.44	.367	.281		89.65	5.19	5.16	10.35	
" 503	83.53	16.47	2.27		6.84	3.51	10.35	.306	.231		85.46	7.58	6.96	14.54	
" 504	83.80	16.20	2.39		7.00	3.00	10.00	.348	.225		88.71	5.78	5.51	11.29	
Average	83.96	16.04	2.28		7.19	3.26	10.45	.379	.237		87.07	6.92	6.01	12.93	

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄		Crude protein Nx6 $\frac{1}{4}$		Edible		Waste	
	percent	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent	percent	percent	percent	percent	Skins percent	Core percent	Total percent
APPLES—Continued.															
Jonathan—Non-Irrigated															
No. 481a	82.56	17.44	2.81	8.00	4.63	12.63	.526	.300	87.88	7.86	4.26	12.12			
" 482a	81.18	18.82	2.78	8.02	4.82	12.84	.550	.344	87.72	8.02	4.26	12.28			
" 483a	83.24	16.76	2.60	7.52	3.32	10.84	.415	.263	89.18	5.78	5.04	10.82			
" 484a	80.18	19.82	3.00	8.74	4.19	12.93	.569	.363	86.54	7.25	6.21	13.46			
" 485a	82.59	17.41	2.71	7.54	3.26	19.80	.455	.363	87.72	7.85	4.43	12.28			
" 486a	83.44	16.56	2.57	7.79	3.59	11.38	.497	.231	88.67	6.24	5.09	11.33			
" 487a	81.13	18.87	2.79	7.62	4.41	12.03	.520	.231	87.02	7.80	5.18	12.98			
" 488a	82.56	17.44	2.62	8.01	3.66	11.67	.478	.282	89.85	5.97	4.18	10.15			
Average	82.11	16.89	2.74	7.91	3.98	11.89	.501	.297	88.07	7.10	4.83	11.93			
Jonathan—Non-Irrigated															
No. 489a	80.45	19.55	4.87	9.98	1.81	11.79	.345	.275	87.96	6.60	5.44	12.04			
" 490	79.65	20.35	4.13	9.68	1.92	11.60	.360	.263	84.78	8.06	7.16	15.22			
" 491	80.87	19.13	3.45	10.10	1.77	11.87	.275	.243	83.99	8.47	7.54	16.01			
" 492	81.33	18.67	3.98	10.02	1.70	11.72	.338	.325	83.25	8.63	8.12	16.75			
" 493	80.63	19.37	3.63	10.00	1.54	11.54	.327	.363	84.32	8.23	7.45	15.68			
" 494	80.73	19.27	3.87	9.83	1.79	11.62	.395	.338	81.54	9.31	9.15	18.46			
" 495	82.13	17.87	4.12	9.10	1.24	10.34	.308	.312	82.47	9.12	8.41	17.53			
" 496	82.34	17.66	3.62	10.00	1.45	11.45	.477	.331	84.48	8.15	7.37	15.52			
Average	81.02	18.98	3.96	9.84	1.65	11.49	.353	.306	84.10	8.32	7.58	15.90			

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein Nx6¼	Pure ash	Edible	Waste	
	percent	percent	Total	Insol- uble	Invert	Cane	Total					percent	percent
								percent	percent	percent	percent		
APPLES—Continued													
Jonathan—Non Irrigated													
Nc. 505	83.04	16.96	2.50	8.84	3.02	11.86	380	.237	86.00	8.22	5.78	14.00	
" 506	83.57	16.43	2.47	7.10	3.87	10.97	430	.206	86.10	7.64	6.26	13.90	
" 507	83.40	16.60	2.63	8.54	2.01	10.55	310	.237	88.01	6.52	5.47	11.99	
" 508	79.62	20.38	3.00	9.00	3.94	12.94	416	.237	86.31	7.78	5.91	13.69	
" 509	81.86	18.14	2.58	8.53	2.76	11.29	371	.231	88.16	6.33	5.51	11.84	
" 510	81.31	18.69	2.51	7.29	3.85	11.14	384	.194	87.69	7.47	4.81	12.31	
Average	82.13	17.87	2.62	8.22	3.24	11.46	382	.224	87.05	7.32	5.63	12.95	
Jonathan—Non-Irrigated													
No. 511	82.87	17.13	2.76	7.96	3.81	11.77	416	.156	89.51	5.59	4.90	10.49	
" 512	81.11	18.89	2.90	7.94	3.88	11.82	419	.219	89.78	5.21	5.01	10.22	
" 513	82.43	17.57	2.78	8.14	3.22	11.36	367	.137	87.24	6.79	5.97	12.76	
" 514	82.29	17.71	2.76	6.88	3.44	10.32	363	.169	86.47	7.09	6.44	13.53	
" 515	81.84	18.16	2.97	7.55	3.33	10.88	306	.206	87.94	6.45	5.61	12.06	
" 516	82.37	17.63	3.20	7.43	3.70	11.13	404	.156	86.11	7.34	6.55	13.89	
Average	82.15	17.85	2.90	7.65	3.56	11.21	399	.174	87.84	6.41	5.75	12.16	
Jonathan—Non-Irrigated													
No. 321a	81.13	18.87	1.03	6.41	5.03	11.44	180	.560	84.58			15 42	
Jonathan—Non-Irrigated													
" 716	83.11	16.89	3.32	5.27	3.71	8.98	444	.263	90.53	6.14	3.33	9.47	
" 717	82.91	17.09	3.25	6.32	4.17	10.49	465	.194	89.02	6.38	4.60	10.98	
" 718	83.25	16.75	2.33	6.70	3.00	9.70	397	.238	91.84	4.20	3.96	8.16	
" 719	83.94	16.06	2.53	6.92	4.10	11.02	402	.219	90.89	5.63	3.48	9.11	

a Grown at Chelan, Washington. Omitted from General Average.

TABLE III — Continued — POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein Nx6½%	Pure ash	Edible		Waste		
	percent	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent				percent	percent	Skins percent	Core percent	Total percent
								percent	percent						
APPLES—Continued															
Mammoth Black Twig—Irr.															
No. 603	82.65	17.35	2.42	7.98	3.57	11.55	.278	.175	92.57	4.35	3.08	7.43			
" 604	81.21	18.79	3.13	9.05	2.94	11.99	.247	.181	89.00	5.61	5.39	11.00			
" 631	80.50	19.50	3.23	8.52	3.63	12.15	.374	.305	89.13	6.57	4.30	10.87			
Average	82.10	17.90	2.85	8.20	3.54	11.74	.318	.188	89.84	6.06	4.10	10.16			
Minkler—Non-Irrigated															
No. 314	80.57	19.43	3.21	8.24	4.37	12.61	.430	.440	81.82			18.18			
R. I. Greening—Non-Irrigated															
No. 315	82.80	17.20	2.94	6.61	3.44	10.05	.430	.470	79.31			20.69			
Rome Beauty—Irrigated															
No. 523	85.98	14.02	2.28	5.07	4.39	9.46	.155	.262	88.65	6.03	5.32	11.35			
" 524	84.31	15.69	2.04	6.40	4.70	11.10	.187	.219	86.81	6.34	6.85	13.19			
" 525	85.16	14.84	2.05	5.31	5.01	10.32	.187	.231	89.46	6.55	3.99	10.54			
" 526	85.26	14.74	2.30	5.74	4.31	10.05	.237	.231	89.90	6.83	3.27	10.10			
" 527	83.27	15.73	2.45	5.60	5.45	11.05	.286	.169	90.99	5.86	3.15	9.01			
" 528	85.79	14.21	2.15	4.68	5.18	9.86	.223	.222	89.38	6.31	4.31	10.62			
Average	84.96	15.04	2.21	5.47	4.84	10.31	.213	.222	89.20	6.32	4.48	10.80			
Rome Beauty—Irrigated															
No. 584	85.33	14.67	2.98	4.90	4.00	8.90	.261	.163	91.29	6.05	2.66	8.71			
" 585	85.19	14.81	2.55	6.15	3.75	9.90	.246	.125	91.49	5.93	2.58	8.51			
Average	85.26	14.74	2.77	5.53	3.87	9.40	.254	.144	91.39	5.99	2.62	8.61			
Rome Beauty—Irrigated															
No. 611	84.92	15.08	2.32	5.85	4.46	10.31	.247	.138	91.80	5.87	2.33	8.20			

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty H ₂ SO ₄	Crude protein Nx6¼	Pure ash	Edible	Waste	
	percent	percent	Insol- ble percent	Total percent	Invert percent	Cane percent	Total percent					percent	percent
								percent	percent				
APPLES—Continued													
Rome Beauty—Irrigated													
No. 612	82.75	17.25	2.63	6.97	3.79	10.76	.228	.131	90.86	6.22	2.92	9.14	
" 613	83.71	16.29	2.78	6.13	4.57	10.70	.237	.150	91.56	5.82	2.62	8.44	
" 623	86.30	13.70	2.30	6.00	3.47	9.47	.233	.169	90.51	5.07	4.42	9.49	
" 624	84.45	15.55	2.34	8.07	2.32	10.39	.256	.144	90.95	4.87	4.18	9.05	
Average	84.43	15.57	2.47	6.60	3.72	10.32	.240	.146	91.14	5.57	3.29	8.86	
Rome Beauty—Irrigated													
No. 638	85.60	14.40	2.24	6.56	2.67	9.23	.181	.150	88.00	6.60	5.40	12.00	
" 639	85.48	14.52	2.37	5.80	2.94	8.74	.237	.175	87.46	7.14	5.40	12.54	
" 640	84.45	15.55	2.67	5.71	3.68	9.39	.276	.150	90.08	5.24	4.68	9.92	
" 641	86.15	13.85	2.15	6.58	3.89	10.47	.139	.162	89.35	5.94	4.71	10.65	
" 642	85.85	14.15	2.58	5.83	3.00	8.83	.280	.219	89.53	5.76	4.71	10.47	
" 643	84.88	15.12	2.34	6.80	3.87	10.67	.190	.162	89.59	5.53	4.88	10.41	
Average	85.40	14.60	2.40	6.21	3.34	9.55	.217	.170	89.00	6.04	4.96	11.00	
Rome Beauty—Irrigated													
No. 725	84.08	15.92	2.45	5.39	5.82	11.21	.327	.188	90.80	6.30	2.90	9.20	
" 726	82.42	17.58	2.43	5.22	5.18	10.40	.367	.181	90.23	6.79	2.98	9.77	
" 727	84.34	15.66	2.56	6.17	4.10	10.27	.334	.294	90.45	6.48	3.07	9.55	
" 728	84.60	15.40	2.57	5.59	4.46	10.05	.301	.263	89.20	6.75	4.05	10.80	
" 729	84.64	15.36	2.23	5.09	5.63	10.72	.310	.219	91.07	5.38	3.55	8.93	
" 730	85.38	14.62	2.14	5.54	2.33	7.87	.308	.381	90.95	5.35	3.70	9.05	
Average	84.24	15.76	2.40	5.50	4.59	10.09	.325	.254	90.45	6.17	3.38	9.55	
General Average	84.81	15.19	2.40	5.88	4.12	10.00	.249	.195	90.01	6.04	3.95	9.99	

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein Nx6%	Pure ash	Edible	Waste	
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	Skins percent					Core percent	Total percent
								percent	percent				
APPLES—Continued													
Rome Beauty—Non-Irrigated No. 320	83.74	16.26	2.78	6.06	4.21	10.27	.210	.350	.22	86.96			13.04
Rome Beauty—Non-Irrigated No. 745a	84.31	15.69	2.88	6.00	3.36	9.36	.214	.294		90.27	6.19	3.54	9.73
Rome Beauty—Non-Irrigated No. 529	79.47	20.53	4.06	8.85	3.73	12.58	.293	.300		86.49	8.15	5.36	13.51
" 530	79.18	20.82	4.22	7.90	3.83	11.73	.286	.400		88.27	7.13	4.60	11.73
" 531	82.44	17.56	3.89	8.30	3.12	11.42	.240	.400		86.10	7.74	6.16	13.90
" 532	80.72	19.28	3.69	7.81	3.62	11.43	.253	.219		88.38	6.61	5.01	11.62
" 533	81.77	18.23	3.79	7.52	3.78	11.30	.290	.306		89.36	5.74	4.90	10.64
" 534	82.01	17.99	4.06	7.81	3.49	11.30	.322	.350		88.97	5.93	5.10	11.03
" 535	82.54	17.46	3.55	7.90	3.11	11.01	.206	.331		88.48	7.21	4.31	11.52
" 536	83.15	16.85	3.27	7.97	2.63	10.60	.264	.325		89.24	6.35	4.41	10.76
Average	81.41	18.59	3.82	8.01	3.41	11.42	.269	.319		88.16	6.86	4.98	11.84
Rome Beauty—Non-Irrigated No. 312	81.84	18.16	2.19	6.59	4.08	10.67	.630	.410	.22	88.64			11.36
" 537	82.29	17.71	2.58	6.50	3.99	10.49	.170	.231		88.38	7.56	4.06	11.62
" 538	84.32	15.68	2.82	6.97	3.77	10.74	.291	.269		89.14	7.05	3.81	10.86
" 539	84.35	15.65	2.49	6.64	3.71	10.35	.240	.375		92.34	4.55	3.11	7.66
" 540	85.13	14.87	2.46	6.57	3.46	10.03	.239	.275		92.69	4.30	3.01	7.31
" 541	85.07	14.93	2.42	5.81	3.88	9.69	.280	.287		92.25	4.23	3.52	7.75
" 542	83.24	16.76	2.74	6.74	4.38	11.12	.300	.319		92.03	4.48	3.49	7.97
" 543	83.18	16.82	2.67	6.13	4.28	10.41	.230	.237		92.70	4.56	2.74	7.30

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidity as H ₂ SO ₄		Crude protein Nx6½		Pure ash		Edible		Waste	
	percent	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent	percent	percent	percent	percent	percent	percent	Skins percent	Core percent	Total percent
APPLES—Continued																	
Rome Beauty—Non-Irrigated																	
No. 544	83.49	16.51	2.57	2.57	5.92	4.71	10.63	.249	.237			92.41	4.10	3.49	7.59		
Average	83.66	16.34	2.56	2.56	6.43	4.03	10.46	.292	.293			91.49	5.10	3.41	8.51		
Rome Beauty—Non-Irrigated																	
No. 731	81.98	18.02	2.63	2.63	6.40	3.08	9.48	.364	.194			88.82	7.89	3.29	11.18		
" 732	81.86	18.14	2.61	2.61	7.07	5.43	12.50	.379	.156			89.06	7.78	3.16	10.94		
" 733	82.49	17.51	2.74	2.74	5.85	5.10	10.95	.311	.225			89.84	7.35	2.81	10.16		
" 734	81.79	18.21	2.69	2.69	5.92	4.82	10.74	.390	.188			89.68	7.54	2.78	10.32		
" 735	83.13	16.87	2.62	2.62	5.72	5.08	10.80	.407	.169			87.79	8.33	3.88	12.21		
" 736	83.21	16.79	2.60	2.60	6.22	5.29	11.51	.313	.213			90.93	5.66	3.41	9.07		
Average	82.41	17.59	2.65	2.65	6.20	4.80	11.00	.361	.191			89.35	7.43	3.22	10.65		
Rome Beauty—Non-Irrigated																	
No. 737	84.09	15.91	2.84	2.84	5.47	4.49	9.96	.388	.213			90.45	5.98	3.57	9.55		
" 738	83.80	16.20	2.97	2.97	5.48	4.26	9.74	.425	.256			92.53	5.80	1.67	7.47		
" 739	85.02	14.98	2.85	2.85	5.22	4.32	9.54	.384	.219			91.37	5.78	2.85	8.63		
" 740	84.21	15.79	2.87	2.87	5.49	4.46	9.95	.384	.333			89.40	6.80	3.80	10.60		
" 741	83.60	16.40	3.14	3.14	6.11	3.68	9.79	.193	.213			90.13	6.09	3.78	9.87		
" 742	84.48	15.52	2.88	2.88	5.78	4.56	10.34	.258	.181			90.81	5.76	3.43	9.19		
" 743	86.73	13.27	2.68	2.68	5.21	3.98	9.19	.284	.263			91.01	5.82	3.17	8.99		
" 744	84.83	15.17	2.87	2.87	5.44	3.90	9.34	.287	.281			90.43	5.81	3.76	9.57		
Average	84.59	15.41	2.87	2.87	5.52	4.21	9.73	.325	.245			90.77	5.98	3.25	9.23		
General Average	83.08	16.92	2.98	2.98	6.56	4.06	10.62	.308	.266			90.00	6.26	3.74	10.00		

TABLE III—Continued — POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar		Acidi- ty as H ₂ SO ₄	Crude protein Nx6 $\frac{1}{4}$	Pure ash	Edible	Waste		
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent					Skins percent	Core percent	Total percent
							percent	percent					
APPLES—Continued													
Spitzenberg—Non-Irrigated													
No. 745	84.00	16.00	3.54	5.76	3.38	9.14	.334	.356		87.90	8.10	4.00	12.10
" 746	83.47	16.53	3.68	5.48	3.45	8.93	.334	.325		93.08	3.91	3.01	6.92
Average	83.74	16.26	3.61	5.62	3.42	9.04	.334	.340		90.49	6.00	3.51	9.51
Spitzenberg—Non-Irrigated													
No. 747	82.61	17.39	3.17	6.53	4.30	10.83	.336	.288		86.47	8.04	5.49	13.53
" 748	81.24	18.76	3.47	7.27	4.77	12.04	.357	.306		88.62	7.47	3.91	11.38
" 749	80.72	19.28	3.68	6.50	4.86	11.36	.362	.300		87.21	7.36	5.43	12.79
" 750	81.92	18.08	3.61	6.43	3.52	9.95	.348	.269		87.17	7.61	5.22	12.83
" 751	81.82	18.18	3.63	6.92	4.28	11.20	.374	.394		87.69	7.73	4.58	12.31
" 752	82.66	17.34	3.72	6.87	3.69	10.56	.381	.325		86.62	7.85	5.53	13.38
Average	81.83	18.17	3.21	6.74	4.24	10.99	.360	.314		87.30	7.67	5.03	12.70
General Average													
Tompkins King—Non-Irr.													
No. 753	79.89	20.11	2.69	6.88	5.61	12.49	.402	.388		92.23	5.26	2.51	7.77
" 754	81.89	18.11	2.29	6.72	4.95	11.67	.404	.306		91.42	5.75	2.83	8.58
" 755	82.05	17.95	2.40	6.56	4.65	11.21	.263	.313		92.48	5.16	2.36	7.52
" 756	81.52	18.48	2.56	6.36	4.94	11.30	.357	.369		91.27	5.56	3.17	8.73
" 757	82.81	17.19	2.59	6.80	4.87	11.67	.381	.313		89.72	6.34	3.94	10.28
" 758	80.88	19.12	2.27	7.16	4.87	12.03	.388	.325		91.15	6.33	2.52	8.85
Average	81.51	18.49	2.47	6.75	4.98	11.73	.366	.336		91.38	5.73	2.89	8.62

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein as Nx6%	Pure ash	Edible		Waste		
	percent	percent	Total	Insolu- ble	Invert	Cane	Total				percent	percent	percent	percent	Skins
								percent	percent	percent					
APPLES—Continued															
Winesap—Irrigated															
No. 587	85.24	14.76	2.88	7.87	1.91	9.78	.299	.137	91.25	5.28	3.47	8.75			
" 588	80.36	19.64	2.54	8.38	2.93	11.31	.308	.256	90.72	5.46	3.82	9.28			
Average	82.80	17.20	2.71	8.13	2.42	10.55	.304	.197	90.99	5.37	3.64	9.01			
Winesap—Irrigated															
No. 608	80.84	19.16	2.31	11.30	1.24	12.54	.237	.206							
" 609	78.36	21.64	3.01	11.86	1.97	13.83	.237	.212							
" 610	79.36	20.64	2.52	10.63	1.95	12.58	.279	.188							
" 629	79.50	20.50	2.85	11.53	2.50	14.03	.313	.244	89.02	6.13	4.85	10.98			
" 630	80.75	19.25	2.84	11.22	2.21	13.43	.317	.181	84.02	9.48	6.50	15.98			
Average	79.76	20.24	2.71	11.31	1.97	13.28	.277	.206	86.52	7.80	5.68	13.48			
General Average															
White Pearmain—Irrigated															
No. 605	80.63	19.37	2.71	10.40	2.10	12.50	.285	.203	88.75	6.59	4.66	11.25			
" 606	82.40	17.60	3.14	7.64	3.87	11.51	.200	.225	86.73	7.62	5.65	13.27			
" 607	83.23	16.77	2.84	7.53	3.46	10.99	.237	.219	88.15	7.00	4.85	11.85			
Average	82.59	17.41	3.31	6.56	4.18	10.74	.228	.175	87.37	7.35	5.28	12.63			
	82.74	17.26	3.10	7.24	3.84	11.08	.222	.206	87.42	7.32	5.26	12.58			
Winter Banana—Irrigated															
No. 780	84.88	15.12	3.06	6.86	3.37	10.23	.331	.288	88.84	8.23	2.93	11.16			
" 781	83.13	16.87	2.38	4.70	4.65	9.35	.402	.163	89.57	6.66	3.77	10.43			
" 782	84.58	15.42	2.47	6.32	2.98	9.30	.413	.250	86.52	9.48	4.00	13.48			
" 783	81.65	18.35	2.94	6.07	3.59	9.66	.387	.238	90.48	6.15	3.37	9.52			

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acid- ity as H ₂ SO ₄	Crude protein Nx6%	Pure ash	Edible percent	Waste		
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	Skins percent					Core percent	Total percent	
								percent	percent					
APPLES—Continued														
Winter Banana—Irrigated														
No. 784	83.84	16.16	2.71	5.56	3.85	9.41	.371	.263			91.26	6.76	1.98	8.74
" 785	83.48	16.52	2.65	7.03	3.32	10.35	.413	.288			90.24	6.88	2.88	9.76
Average	83.59	16.41	2.70	6.09	3.63	9.72	.386	.248			89.48	7.36	3.16	10.52
Winter Banana—Non-Irrigated														
No. 771	85.60	14.40	2.91	8.11	3.58	11.69	.297	.244			90.22	6.68	3.10	9.78
" 772	82.53	17.47	2.83	7.65	3.84	11.49	.324	.256			89.01	7.24	3.75	10.99
" 773	81.87	18.13	2.78	7.99	4.26	12.25	.277				89.01	6.89	4.10	10.99
" 774	82.00	18.00	3.23	8.35	3.39	11.74	.306	.319			88.20	7.55	4.25	11.80
" 775	84.65	15.35	2.90	5.37	3.52	8.89	.289	.288			91.04	5.90	3.06	8.96
" 776	84.60	15.40	2.99	5.05	4.11	9.16	.291	.200			91.46	5.63	2.91	8.54
" 777	84.02	15.98	3.18	5.07	3.72	8.79	.308	.281			91.36	5.81	2.83	8.64
" 778	80.64	19.36	2.35	5.69	3.45	9.14	.311	.250			89.54	6.78	3.68	10.46
Average	83.24	16.76	2.90	6.66	3.73	10.39	.300	.263			89.98	6.56	3.46	10.02
Winter Banana—Non-Irrigated														
No. 779	83.36	16.64	3.21	6.54	2.65	9.19	.206	.231			90.40	6.75	2.85	9.60
General Average	83.25	16.75	2.93	6.65	3.61	10.26	.290	.259			90.03	6.58	3.39	9.97
Wagener—Non-Irrigated														
No. 759	86.08	13.92	2.25	5.08	4.96	10.04	.261	.219			91.31	5.42	3.27	8.69
" 760 ^a	90.47	9.53	2.62	5.43	5.12	10.55	.308	.275			90.12	6.45	3.43	9.88
" 761	84.85	15.15	2.80	5.18	4.54	9.72	.284	.238			90.09	6.59	3.32	9.91
" 762	85.65	14.35	2.50	5.77	3.25	9.02	.257	.238			90.02	6.14	3.84	9.98

^a Water and total solids not included in averages.

TABLE III — Continued — POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein Nx6/4	Pure ash	Edible		Waste		
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent				percent	percent	Skins percent	Core percent	Total percent
								percent	percent						
APPLES—Continued															
Wagener—Non-Irrigated															
No. 763	85.52	14.48	2.19	5.26	3.65	8.91	.294	.231		91.16	5.70	3.14	8.84		
" 764	84.67	15.33	2.64	5.62	4.45	10.07	.303	.213		88.76	6.89	4.35	11.24		
Average	85.35	14.65	2.50	5.39	4.33	9.72	.285	.236		90.24	6.20	3.56	9.76		
Wagener—Non-Irrigated															
No. 765	84.54	15.46	2.24	5.59	4.70	10.29	.310	.231		90.43	5.67	3.90	9.57		
" 766	84.57	15.43	2.50	4.67	4.23	8.90	.301	.306		90.74	5.14	4.12	9.26		
" 767	85.73	14.27	2.48	5.38	4.29	9.67	.305	.306		89.96	6.16	3.88	10.04		
" 768	83.74	16.26	2.39	5.21	5.63	10.84	.256	.250		90.50	5.00	4.50	9.50		
" 769	84.46	15.54	3.04	5.56	4.53	10.09	.287	.338		88.38	6.58	5.04	11.62		
Average	84.61	15.39	2.53	5.28	4.68	9.96	.292	.286		90.00	5.71	4.29	10.00		
Wagener—Non-Irrigated															
No. 770	84.93	15.07	2.50	6.75	2.73	9.48	.282	.213							
	84.98	15.02	2.51	5.46	4.34	9.80	.287	.255		90.13	5.98	3.89	9.87		
General Average															
York Imperial—Irrigated															
No. 598	83.08	16.92	3.38	6.18	4.49	10.67	.294	.194		91.42	6.11	2.47	8.58		
" 599	82.57	17.43	3.03	7.14	4.39	11.53	.289	.269		92.04	5.44	2.52	7.96		
" 600	81.33	18.67	3.32	7.38	4.97	12.35	.333	.330		92.74	5.23	2.03	7.26		
" 601	83.13	16.87	2.95	7.25	3.85	11.10	.299	.200		93.25	4.73	2.02	6.75		
" 625	84.26	15.74	2.71	6.56	4.28	10.84	.303	.188		89.33	6.03	4.64	10.67		
" 626	85.07	14.93	2.93	7.42	2.98	10.40	.313	.163		90.22	5.50	4.28	9.78		
" 627	84.14	15.86	3.11	7.40	2.76	10.16	.286	.163		90.97	5.18	3.85	9.03		

TABLE III—Continued—POMACEOUS FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein N x 6/4	Pure ash	Edible	Waste		
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	Skins percent					Core percent	Total percent	
								percent	percent					
APPLES—Continued														
York Imperial—Irrigated														
No. 628	84.25	15.75	2.71	7.82	2.69	10.51	.294	.206			90.53	5.57	3.90	9.47
Average	83.48	16.52	3.02	7.14	3.79	10.93	.301	.194			91.31	5.48	3.21	8.69
Yellow Newtown—Irrigated														
No. 614	82.19	17.81	2.94	8.12	3.41	11.53	.405	.150			90.94	5.36	3.70	9.06
" 615	82.22	17.78	3.19	8.09	3.55	11.64	.440	.213			88.89	7.34	3.67	11.01
" 616	83.46	16.54	3.01	7.48	3.39	10.87	.369	.144			89.63	7.24	3.13	10.37
Average	82.62	17.38	3.05	7.90	3.45	11.35	.405	.169			89.85	6.65	3.50	10.15
Yellow Newtown—Irrigated														
No. 787	82.97	17.03	2.54	7.05	4.52	11.57	.332	.200			89.11	6.88	4.01	10.89
General Average	82.71	17.29	2.92	7.68	3.72	11.40	.387	.177			90.76	5.89	3.35	9.24
Yellow Newtown—Non-Irr.														
No. 786 ^a	81.60	18.40	2.54	6.26	6.56	12.82	.347	.163			90.92	5.53	3.65	9.08
Yellow Newtown—Non-Irr.														
No. 788	79.42	20.58	3.72	7.54	4.75	12.29	.476	.300						
" 789	80.61	19.39	3.85	7.49	5.49	12.98	.462	.419						
" 790	81.43	18.57	3.93	6.95	4.17	11.12	.473	.325						
" 791	81.03	18.97	4.90	6.27	4.33	10.60	.449	.484						
" 792	79.93	20.07	4.18	6.54	4.48	11.02	.485	.363						
Average	80.48	19.52	4.12	6.96	4.64	11.60	.469	.378						

^a Grown at Roanoke, Virginia.

TABLE IV—POMACEOUS FRUITS

INSOLUBLE SOLIDS, SUGAR, ACID, AND CRUDE PROTEIN CALCULATED ON AVERAGE CONTENT OF DRY MATTER.

Fruit and variety	Number of analyses	Insoluble solids percent	Sugar total percent	Acid as H ₂ SO ₄ percent	Crude protein Nx6¼ percent
APPLES—Fall					
Miscellaneous—Irrigated					
Early Pennock	1	22.53	65.59	1.78	1.68
Fall Rambo	1	26.88	52.96	2.64	.76
Peck's Pleasant	1	27.28	52.46	3.43	.99
Red Ast.achan	1	13.04	50.44	3.87	1.59
Whitney No. 20	1	16.91	61.67	1.23	1.23
Yellow Harvest	1	14.97	71.54	.98	1.68
Miscellaneous—Non-Irrigated					
Gravenstein	1	17.13	50.86	3.08	1.83
Jefferis	1	15.79	57.40	1.69	1.80
Red Astrachan	1	18.47	61.03	4.34	3.80
Yellow Transparent	1	15.13	57.33	6.51	4.88
APPLES—Winter					
Aikin Red—Irrigated	3	16.24	63.66	1.37	1.03
Arkansas Black—Irrigated	5	16.41	63.06	1.86	1.33
“ “ —Non-Irrigated	6	19.83	66.78	1.67	1.97
Ben Davis—Irrigated	7	20.17	61.50	1.73	1.09
“ “ —Non-Irrigated	17	22.85	58.85	1.54	1.78
Gano—Irrigated	3	18.23	63.55	1.97	.94
“ —Non-Irrigated	21	20.43	61.70	1.50	1.67
Grimes Golden—Irrigated	1	13.43	60.92	1.60	.96
“ “ —Non-Irrigated	4	18.08	65.30	2.30	1.44
Jonathan—Irrigated	33	13.97	64.05	2.30	1.17
“ —Non-Irrigated	46	16.51	63.25	2.32	1.43
Kinnard—Irrigated	3	17.08	64.26	1.85	1.21
Mammoth Black Twig—Irr.	8	15.92	65.59	1.78	1.05
Minkler—Non-Irrigated	1	16.52	64.90	2.21	2.26
R. I. Greening—Non-Irrigated	1	17.09	58.43	2.50	2.73
Rome Beauty—Irrigated	25	15.80	65.83	1.64	1.28
“ “ —Non-Irr.	33	17.61	62.77	1.82	1.57
Spitzenberg “ “	8	20.13	59.36	2.00	1.80
Tompkins King “ “	6	13.36	63.44	1.98	1.81
Wagener “ “	12	16.71	65.25	1.91	1.70
White Pearmain —Irrigated	3	17.96	64.14	1.29	1.19
York Imperial— “	8	18.28	66.16	1.82	1.17
Yellow Newtown— “	4	16.89	65.93	2.24	1.02
“ “ —Non-Irr.	5	21.11	59.43	2.40	1.93

TABLE IV—Continued—POMACEOUS FRUITS

Fruit and variety	Number of analyses	Insoluble solids percent	Sugar total percent	Acid as H ₂ SO ₄ percent	Crude protein N×6¼ percent
APPLES—Continued					
Winesap —Irrigated	7	13.99	64.53	1.47	1.05
Winter Banana— “	6	16.45	59.23	2.35	1.51
“ “ —Non-Irrigated	9	17.49	61.25	1.73	1.54
PEARS					
Bartlett—Irrigated	2	17.20	47.07	1.62	1.26
“ —Non-Irrigated	2	17.95	45.60	.54	2.87
Winter Nelis— “ “	1	25.35	45.99	.41	2.56

In this division, pomaceous fruits, are included apples and pears only. In both irrigated and non-irrigated sections of the state the apple takes highest rank among all fruits in point of commercial importance. Of particular interest, therefore are the analyses of the more important varieties.

In Table III are shown results of individual analyses, averages for all samples of the same variety grown in one and the same orchard, and general averages for all samples of the same variety, grown either with or without irrigation. In all cases the whole fruit exclusive of the stem, seeds, and the smallest possible core was used for analysis. In Table IV are shown average results for insoluble solids, sugar, acid, and crude protein calculated on average content of dry matter.

Apples: From the tabulated results it is apparent that fall varieties are slightly lower than winter varieties in sugar but decidedly higher in acid. While variety differences are apparent, the results indicate a remarkable degree of uniformity in the composition of specimens which represented any one variety. Of nineteen well-known winter varieties represented by analyses in Tables III and IV, comparison of irrigated and non-irrigated with fairness may well be made on eight.

It is evident that there are slight differences in composition of apples of the same variety grown with and without irrigation. With few exceptions the average sample grown with irrigation contained the smaller percentage of total solids, insoluble solids, sugar, acid, and crude protein. Differences, however, especially in total sugar and acid content were very small. When these constituents were calculated on the average content of dry matter, in fully half of the

varieties, the advantage, if the greater percentage of sugar and acid may thus be spoken of, was with the irrigated samples. The lowest average sugar content was found in the irrigated Winter Banana, the highest in the non-irrigated Minkler. The lowest average acid content was found in the irrigated White Pearmain, the highest in the non-irrigated Yellow Newtown. Without exception the average crude protein and the average insoluble solids of the irrigated were appreciably less than were those constituents in corresponding non-irrigated samples.

TABLE V—POMACEOUS FRUITS—APPLES

ANALYSES OF FRUIT PICKED FROM DIFFERENT SIDES OF TREE

FRUIT	Side of Tree	No. Analyses Averaged	Water percent	Solids		Sugar			Acidity as H ₂ SO ₄ percent	Crude protein Nx6¼ percent
				Total percent	Insoluble percent	Invert percent	Cane percent	Total percent		
Ben Davis--Non-Irr.	N	4	81.13	18.87	4.30	7.95	3.37	11.32	.288	.284
“ “ “ “	S	4	81.45	18.55	4.84	7.60	3.37	10.97	.295	.344
“ “ “ “	E	4	81.27	18.73	4.32	7.65	3.50	11.15	.272	.334
“ “ “ “	W	4	81.20	18.80	4.27	7.41	3.64	11.05	.323	.302
Gano—Non-Irr.	N	4	82.77	17.23	3.50	6.82	3.66	10.48	.275	.244
“ “ “ “	S	4	82.76	17.24	3.48	7.41	3.84	11.25	.231	.322
“ “ “ “	E	4	83.06	16.94	3.41	7.05	3.28	10.33	.241	.281
“ “ “ “	W	4	83.12	16.88	3.52	7.28	3.69	10.97	.245	.311
Jonathan—Irr.	N	6	83.06	16.94	2.43	7.92	3.24	11.16	.392	.221
“ “	S	6	81.61	18.39	2.64	8.17	3.49	11.66	.438	.177
“ “	E	7	82.40	17.60	2.41	7.77	3.25	11.02	.408	.178
“ “	W	5	83.02	16.98	2.51	7.34	3.59	10.93	.445	.205
Jonathan -Non-Irr.	N	6	83.23	16.77	2.90	8.17	2.47	10.64	.394	.270
“ “ “ “	S	6	82.12	17.88	3.22	8.22	3.01	11.23	.402	.257
“ “ “ “	E	6	82.21	17.79	2.95	8.33	3.24	11.07	.391	.278
“ “ “ “	W	6	82.14	17.86	2.96	8.46	3.10	11.56	.426	.304
Rome Beauty--Non-Irr.	N	4	83.79	16.21	2.94	7.27	3.23	10.50	.237	.327
“ “ “ “	S	4	81.74	18.26	3.36	7.33	3.96	11.29	.290	.227
“ “ “ “	E	4	82.60	17.40	3.31	7.20	3.76	10.96	.268	.289
“ “ “ “	W	4	82.46	17.54	3.21	7.04	3.93	10.97	.243	.273

Because of unequal exposure to direct sunlight during the ripening period it was thought possible that apples, especially in sugar and acid content, might vary with position on the tree on which they grew and ripened. At picking time in the fall of 1910 samples of Ben Davis, Gano, Jonathan, and Rome Beauty were picked with this point in mind. The North, South, East and West sides of trees in several orchards are represented by samples in

Table V. From this table it is apparent that formation of sugar and acid in the apple is independent of its exposure in the tree.

At this point it may be well also to call attention to this fact: The various samples of irrigated apples whose analyses are recorded in the preceding tables of this division were grown in orchards located either on level land or on land with very moderate slopes to north, south, east, or west. Many of the non-irrigated samples were grown in orchards of the Palouse Country, where slope, or exposure to the various points of the compass, in some instances is very pronounced. It is a matter of common observance that of several orchards occupying sites of pronounced exposure, those with southerly exposure produce the more highly colored fruit. But when it is noted that Nos. 557-564 of Ben Davis, Nos. 549-556 of Gano, Nos. 481a-488a of Jonathan, and Nos. 529-536 of Rome Beauty, were grown in an orchard which has a pronounced southeast exposure; Nos. 573-580 of Ben Davis, Nos. 565-572 of Gano, Nos. 497-504 of Jonathan, and Nos. 537-545 of Rome Beauty were grown in an orchard located on an abrupt north hill slope; Nos. 489a-496 of Jonathan were grown in an orchard with a south exposure; and Nos. 505-510 of Jonathan were grown in an orchard which is located on level land, it is plain that material differences in composition can scarcely be traced with positiveness to difference in exposure of the orchard site.

Pears: The Bartlett is the one variety of pears found in both irrigated and non-irrigated sections. In crude protein, as was the case with the majority of apple samples, the non-irrigated were the higher; in total solids, sugar, and acid the irrigated samples were higher. The extremely low acid content of the non irrigated samples is remarkable.

Waste: The edible portion of apples and pears is the whole fruit minus its stems, seeds and core, and thinnest possible parings. The significance of waste on these fruits will become apparent, especially to those who are interested in the canning and allied industries, when it is stated that the percentage of the sugar in the waste approximates very closely that contained in the fresh whole fruit. In the preparation of one ton of apples for canning purposes, there are discarded as waste between 200 and 300 pounds of material which contain between 20 and 30 pounds of sugar. The economical saving of this amount of sugar in the form of alcohol, vinegar, or other by-product should prove to be an item of importance to canners.

It is apparent from Table III that fall varieties run higher in waste than winter varieties. As between irrigated and non-irrigated apples of the same variety, differences are in favor of the irrigated ones; for in five out of seven varieties which are represented in the table by samples grown with and without irrigation, from the average irrigated sample was taken the smaller percentage of waste. For practical purposes, however, such differences as those noted are inappreciable. The lowest average waste (8.51 percent) was taken from the irrigated Arkansas Black; the highest (14.77 percent) from the non-irrigated Ben Davis.

TABLE VI—SMALL FRUITS—BLACKBERRIES, CURRANTS, DEWBERRIES, GOOSEBERRIES, GRAPES, LOGANBERRIES, RASPBERRIES AND STRAWBERRIES.

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidi- ty as H ₂ SO ₄	Crude protein N x 6 1/4	Pure ash	Edible		Waste		
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent				percent	percent	percent	percent	percent
								percent	percent						
BLACKBERRIES															
Irrigated.—No. 430	79.44	20.56	5.82	10.28				10.28	.363	1.156					
" 432	82.61	17.39	5.69	7.34				7.34	.376	.881					
" 438	85.64	14.36	5.77	5.85			.35	6.20	.773	.856					
" 442a	82.42	17.58	6.10	7.62			.13	7.75	.688	1.219					
" 448	80.36	19.64	7.59	7.57			.10	7.57	.679	.962					
Average	82.09	17.91	6.19	7.73				7.83	.576	1.015					
Non-Irrigated—No. 279	82.98	17.02	6.70	4.06				4.06	.900	1.320					
CURRANTS															
Red—Non-Irrigated—No. 263	80.10	19.90	8.03	5.80				5.80	1.650	1.060					
" 265	81.83	18.17	8.76	4.93			.54	5.47	1.550	1.560	.64				
Average	80.91	19.09	8.39	5.37			.27	5.64	1.600	1.310					
White—Non-Irrigated—No. 264	80.53	19.47	8.99	4.94				4.94	1.650	1.750					
DEWBERRIES															
Irrigated—No. 431	85.56	14.44	4.23	5.03				5.03	.601	.800					
" 433	83.75	16.25	5.19	4.88			.39	5.27	.422	.875					
" 439	83.45	16.55	6.25	7.58			.10	7.68	.520	1.075					
" 442	80.58	19.42	4.46	6.74				6.74	.629	1.250					
" 446	84.09	15.91	5.04	5.90			.21	6.11	.341	1.275	.53				
Average	83.49	16.51	5.03	6.03			.14	6.17	.503	1.055					
Non-Irrigated—No. 278	86.37	13.63	5.30	4.04				4.04	1.25	1.380	.42				
" 672	86.08	13.92	6.97	4.26				4.26	.905	1.687					
" 673	84.52	15.48		5.11				5.11	.905	1.400					
" 674	87.75	12.25	6.01	5.68				5.68	.787	1.356					

TABLE VI — Continued — SMALL FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar		Acidi- ty as H ₂ SO ₄	Crude protein Nx6¼	Pure ash	Edible percent	Waste		
	Total	Insolu- ble	Invert	Cane	Total	Seeds					Skins	Total	
	percent	percent	percent	percent	percent	percent	percent	percent	percent	percent	percent	percent	
DEWBERRIES—Continued													
Non-Irrigated	86.18	13.82	6.09	4.77	4.77	.993	1.456						
Average													
GOOSEBERRIES									.41				
Irrigated—No. 377	90.00	10.00	3.89	1.77	.22	1.99	1.180	.940					
Non-Irrigated—No. 245	86.88	13.12	7.04	2.50	1.13	3.63	2.120	.940					
248	86.88	13.12	5.79	2.46	.90	3.36	1.500	.750					
251	88.87	11.13	3.89	3.48	1.58	5.06	1.700	.820					
Average	87.54	12.46	5.57	2.81	1.20	4.01	1.770	.840					
HUCKLEBERRIES													
Wild—No. 287	85.34	14.66	2.94	9.36	9.36	.870	.500						
GRAPES													
No. 452a Delaware—Irr.	78.77	21.23	6.48	9.64	9.64	.594	.919			77.12	6.58	16.30	22.88
308 —Non-Irr.	73.81	26.19	5.92	11.33	11.33	.830	2.190			75.95	5.83	18.22	24.05
No. 451a—Niagara—Irr	76.59	23.41	4.56	12.02	12.02	.963	.725			76.40	5.57	18.03	23.60
453a—	78.29	21.71	7.34	7.62	7.62	1.063	1.049			75.20	10.05	14.75	24.80
Average	77.44	22.56	5.95	9.82	9.82	1.013	.887			75.80	7.81	16.39	24.20
No. 309 —Niagara—Non-Irr.	80.13	19.87	4.24	10.00	10.00	.960	1.750			82.76	5.20	12.04	17.24
301 Bl. Hamburg	81.15	18.85	2.91	13.09	13.09	.391	.500			83.60	4.04	12.36	16.40
302 Isabella	81.48	18.52	4.79	8.41	1.16	9.57	1.060	.90	.44	77.06	4.30	18.64	22.92
307 Salem	81.20	18.80	4.63	9.20	9.20	.860	1.370			76.00	4.75	19.25	24.00

TABLE VI—Continued—SMALL FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidity as H ₂ SO ₄	Crude protein Nx6½	Pure ash	Edible		Waste		
	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent	percent				percent	percent	percent	Stems percent	Total percent
								percent	percent						
RASPBERRIES—Continued															
Red—Irrigated															
No. 398	81.45	18.55	8.35	4.81	1.61	6.42	.715	1.113							
" 399	80.28	19.72	8.86	3.14	3.19	6.33	.924	1.106							
" 401	87.24	12.76	7.89	2.38	1.11	3.49	.859	1.406							
" 402	76.49	23.51	6.57	4.55	2.66	7.21	.811	.831							
" 405	81.07	18.93	6.72	4.92	3.94	8.86	.826	1.050							
" 418	81.19	18.81	7.06	6.45	1.34	7.79	1.170	1.080							
" 421	80.03	19.97	7.07	5.78	2.99	8.77	.727	.831							
" 424	78.90	21.10	6.98	5.52	3.25	8.77	1.100	.831	.47						
" 427	78.92	21.08	7.86	5.68	3.95	9.63	.802	.812							
Average	80.62	19.38	7.48	4.80	2.66	7.46	.882	1.007							
Red—Non-Irrigated															
No. 261	85.40	14.60	5.08	3.70		3.70	1.040	1.810							
" 262	84.11	15.89	5.07	5.82		5.82	.870	1.320							
" 267	81.90	18.10	6.81	6.28	1.28	7.56	1.230	1.060							
Average	83.80	17.20	5.65	5.27	.43	5.70	1.050	1.400							
White—Irrigated															
No. 406	81.43	18.57	7.24	4.04	4.12	8.16	.693	1.156							
White—Non-Irrigated															
No. 266	78.85	21.15	7.49	5.77	3.08	8.85	1.160	1.060							
STRAWBERRIES															
Glen Mary—Irrigated															
No. 376	90.99	9.01	3.11	3.77	.27	4.04	.540	.620						1.74	1.74
									98.26						

TABLE VI—Continued—SMALL FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar		Acid- ity as H ₂ SO ₄	Crude protein N×6%	Pure ash	Edible	Waste	
	percent	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent					Total percent	percent
							percent	percent				
STRAWBERRIES—Continued												
Glen Mary—Irrigated	89.08	10.92	3.31	3.71	.08	3.79	.570	.690		98.49	1.51	1.51
No. 378	90.04	9.96	3.21	3.74	.18	3.92	.555	.655		98.38	1.62	1.62
Average												
Hood River—Irrigated	89.62	10.38	2.66	4.44		4.44	.707	.675		97.99	2.01	2.01
No. 667	86.23	13.77	3.58	4.88		4.88	.952	.869		96.20	3.80	3.80
" 668	89.76	10.24	2.97	3.44		3.44	.905	.781		96.05	3.95	3.95
" 669	88.24	11.76	3.39	3.42		3.42	1.109	.719		96.13	3.87	3.87
" 670	85.81	14.19	3.62	6.14		6.14	1.058	.725		96.14	3.86	3.86
" 671	87.93	12.07	3.24	4.46		4.46	.946	.754		96.50	3.50	3.50
Average												
Hood River—Non-Irrigated												
No. 249	87.20	12.80	4.55	4.33		4.33	.980	1.000		94.05	5.95	5.95
" 250	85.95	14.05	3.90	4.90		4.90	1.200	.880		95.50	4.50	4.50
" 255	85.19	14.81	3.07	7.43	.24	7.67	.890	.750		97.70	2.30	2.30
" 256	79.00	21.00	3.65	7.98	.48	8.46	.690	.820	.54	91.90	8.10	8.10
Average	84.34	15.66	3.79	6.16	.18	6.34	.940	8.60		94.79	5.21	5.21
Jumbo - Irrigated												
No. 391	91.33	8.67	2.32	2.69	1.10	3.79	.692	.381	.37	96.75	3.25	3.52
" 400	91.97	8.03	2.33	3.64	1.01	4.65	.526	.487		98.33	1.67	1.67
Average	91.65	8.35	2.33	3.17	1.10	4.27	.609	.434		97.54	2.46	2.46
Miscellaneous—Irrigated												
No. 387 Brandywine	87.76	12.24	3.83	3.09	1.05	4.14	.833	.894		93.33	6.67	6.67
" 386 Cardinal	89.66	10.34	3.35	4.23	1.12	5.35	.596	.756		96.35	3.65	3.65

TABLE VI—Continued—SMALL FRUITS

Fruit, Variety and Laboratory Number	Water		Solids		Sugar			Acidity as H ₂ SO ₄	Crude protein Nx6¼	Pure ash	Edible		Waste		
	percent	percent	Total percent	Insolu- ble percent	Invert percent	Cane percent	Total percent				percent	percent	Stems percent	Total percent	
STRAWBERRIES—Continued															
Miscellaneous—Irrigated															
No. 383 Chesapeake	90.84	9.16	3.43	3.67	1.34	5.01	.542	.750			97.12	2.88		2.88	2.88
" 393 Climax	89.07	10.93	2.54	4.34	.55	4.89	.874	.493			98.83	1.17		1.17	1.17
" 397 Crescent	91.06	8.94	2.08	4.29		4.29	.486	.400				3.92		3.92	3.92
" 388 Downing	89.89	10.11	3.22	2.90	1.52	4.42	.523	.675			96.08	3.00		3.00	3.00
" 384 Great Washington	89.46	10.54	2.58	2.64	1.44	4.08	.602	.763			97.00				
" 382 Magoon	90.25	9.75	2.70	2.30	.82	3.12	.518	.700				3.93		3.93	3.93
" 389 Miller	88.70	11.30	3.30	4.54	1.41	5.95	.665	.625			96.07	3.72		3.72	3.72
" 385 Morning Star	89.86	10.14	3.32	2.81	1.61	4.42	.831	.844			96.28	2.44		2.44	2.44
" 379 Nick Omer	87.81	12.19	3.30	4.54	1.07	5.61	.480	.737			97.56	2.50		2.50	2.50
" 381 Warfield	86.07	13.93	2.92	2.62	1.42	4.04	.666	.692			97.50	3.39		3.39	3.39
Average	89.20	10.80	3.05	3.50	1.11	4.61	.635	.694			96.61	4.10		4.10	4.10
Miscellaneous—Non-Irrigated															
No. 260 Aroma	86.96	13.04	3.73	4.86		4.86	1.000	1.250			95.90	6.11		6.11	6.11
" 247 Haverland	83.25	16.75	3.62	7.35	.26	7.35	.800	1.060			93.89	3.63		3.63	3.63
" 252 Midnight	85.93	14.07	2.90	4.73	.18	4.99	.780	1.060			96.37	4.70		4.70	4.70
" 259 Mark Hanna	82.15	17.85	4.67	6.19	.80	6.37	1.00	1.190			95.30	3.20		3.20	3.20
" 258 Parson	82.29	17.71	4.24	5.37	.67	5.09	.960	1.440			96.80	4.55		4.55	4.55
" 253 Rough Rider	85.19	14.81	3.50	4.42	.39	4.44	1.000	1.190			95.45	2.00		2.00	2.00
" 254 Sample	86.05	13.95	3.52	4.05		6.32	.960	1.000			98.00	6.45		6.45	6.45
" 246 Senator Dunlap	83.93	16.07	3.76	6.32	1.63	8.55	.910	1.320			97.60	2.40		2.40	2.40
" 257 William Belt	75.24	24.76	3.25	6.92	.44	6.02	.820	1.080			85.89	4.31		4.31	4.31
Average	83.44	16.56	3.66	5.58											

TABLE VII—SMALL FRUITS

INSOLUBLE SOLIDS, SUGAR, ACID, AND CRUDE PROTEIN CALCULATED ON AVERAGE CONTENT OF DRY MATTER.

Fruit and Variety	Number of analyses	Insoluble solids percent	Sugar total percent	Acid as H ₂ SO ₄ percent	Crude Protein N x 6 1/4 percent
BLACKBERRIES					
Irrigated	5	34.56	43.72	3.22	5.66
Non-Irrigated	1	39.36	23.85	5.28	7.76
CURRANTS					
Red—Non-Irrigated	2	43.95	29.54	8.38	6.86
White—““	1	46.17	25.37	8.48	8.99
DEWBERRIES					
Irrigated	5	30.47	37.37	3.05	6.39
Non-Irrigated	4	44.06	34.52	7.18	10.54
GOOSEBERRIES					
Irrigated	1	38.90	19.90	11.80	9.40
Non-Irrigated	3	44.70	32.18	14.21	6.74
GRAPES					
Delaware—Irrigated	1	30.52	45.41	2.79	4.33
“—Non-Irrigated	1	22.60	43.26	3.16	8.36
Niagara—Irrigated	2	26.37	43.53	4.49	3.93
“—Non-Irrigated	1	21.34	50.33	4.83	8.81
LOGANBERRIES					
Irrigated	3	35.65	38.89	8.19	5.62
Non-Irrigated	1	35.62	30.22	13.47	8.74
RASPBERRIES					
Black—Irrigated	6	49.15	32.03	2.55	5.12
“—Non-Irrigated	2	51.30	30.60	3.51	8.17
Red—Irrigated	9	38.60	38.49	4.55	5.19
“—Non-Irrigated	3	32.85	33.14	6.10	8.14
White—Irrigated	1	38.90	43.94	3.73	6.23
“—Non-Irrigated	1	35.41	41.84	5.48	5.02
STRAWBERRIES					
Glen Mary—Irrigated	2	32.23	39.36	5.57	6.57
Hood River—“	5	26.85	36.95	7.84	6.24
“—Non-Irrigated	4	24.20	40.49	6.00	5.49
Jumbo—Irrigated	2	27.90	51.14	7.29	5.19
Miscellaneous—Irrigated	12	28.24	42.69	5.88	6.42
“—Non-Irrigated	9	22.11	36.35	4.95	6.52

In connection with the work on fruits of this division one difficulty not met with on those of the preceding divisions was encountered; except for grapes and strawberries specific variety names could not be secured. Blackberries therefore, and in a similar manner several other kinds of small fruit, were secured, analyzed, and the results recorded simply under the designation "blackberries irrigated" and "blackberries non-irrigated."

The analyses indicate an unlooked-for degree of uniformity in the composition of the several kinds of fruit in this division. It is noticeable that the sugar of the blackberry, currant, dewberry, grape (excepting the Isabella variety) loganberry, and of two or three varieties of strawberries is practically all invert.

As in the preceding divisions the average content of insoluble solids, total sugar, acid, and crude protein was calculated on average content of dry matter or total solids. The results are indicated in Table VII.

Blackberries: In sugar the irrigated samples were decidedly higher than the non-irrigated; in acid and crude protein the reverse was true. In average content of total solids or dry matter the samples grown with and without irrigation were practically the same.

Dewberries: The samples grown with irrigation were higher in dry matter, and sugar, but lower in acid, and crude protein. The same relations held when sugar, acid, and crude protein were calculated on the dry matter.

Gooseberries: The irrigated samples contained the smaller percentage of dry matter, sugar, and acid but the greater percentage of crude protein.

Grapes: Of the two varieties of grapes grown with and without irrigation (if the acid content of the Niagara variety be excepted) the samples grown with irrigation contained the smaller percentage of sugar, acid, and crude protein.

Loganberries: The irrigated samples were lower in dry matter, acid, and crude protein but slightly higher in sugar.

Raspberries, Black: The average irrigated sample contained less dry matter, acid, and crude protein, but practically the same percentage of sugar.

Raspberries, Red: In dry matter and sugar the irrigated samples averaged higher, in acid and crude protein lower.

Raspberries, White: The irrigated sample contained the smaller percentage of dry matter, sugar, and acid and the larger percentage of crude protein.

Strawberries: Of the many varieties cultivated in different parts of the state, but one was found common to both irrigated and non-irrigated sections. The average sample of irrigated Hood River berries contained the smaller

percentage of dry matter, sugar, and crude protein, but practically the same percentage of acid. A study of individual analyses and of the averages for the miscellaneous varieties will warrant the statement that as a rule irrigated strawberries are decidedly lower than non-irrigated ones in dry matter, sugar, acid, and crude protein. Along with decided differences in composition a very marked difference in keeping qualities was noticeable. Those samples which had been grown with irrigation lost their fresh, attractive appearance, which is so highly desired in fruits of this kind, much more quickly after picking than those which had been grown without irrigation. This fact might be cited in support of the popular belief that irrigated fruits, in general, because of their greater water content, are inferior in keeping qualities. It is to be noted however, that, of the large number of analyses of fruits of different kinds which have been recorded on previous pages, in those of strawberries alone were the differences in water content between the irrigated and the non-irrigated sufficiently great as to stand out clearly in support of that belief.

Blackberries and raspberries reach the markets in both the fresh and the desiccated condition. It would seem from results recorded in Table VII, that in the desiccated condition there is sufficient reason for choice between the irrigated and the non-irrigated product; the dry matter of the irrigated samples contained decidedly the greater percentage of sugar and the smaller percentage of acid.

WASTE.

From data recorded in Table VI it is evident that the waste on grapes is very appreciable, ranging as it did in the samples upon which it was determined from 16 to 25 percent. The fruit alone of the strawberry is unaccompanied by waste, but as picked for market purposes, by reason of the attached stems, that factor is worthy of note; in the samples examined it ranged from 1 to 7 percent with the advantage clearly in favor of those grown with irrigation. On other small fruits, waste, for practical purposes, is a negligible factor.

IDAHO EXPERIMENT STATION

OFFICERS

J. A. MacLEAN	President
W. L. CARLYLE	Director
H. MELGARD	Treasurer
FRANCIS JENKINS	Clerk

STATION COUNCIL

E. H. MOFFITT	President Board of Regents
E. S. SWEET	Member Board of Regents
J. A. MacLEAN	President
W. L. CARLYLE	Director
J. S. JONES	Chemist
J. F. NICHOLSON	Bacteriologist
W. H. WICKS	Horticulturist
E. J. IDDINGS	Animal Husbandman

STATION STAFF

W. L. CARLYLE	Director
J. S. JONES	Chemist
J. F. NICHOLSON	Bacteriologist
W. H. WICKS	Horticulturist
E. J. IDDINGS	Animal Husbandman
P. P. PETERSON	Soils
F. L. KENNARD	Farm Crops
G. E. FREVERT	Dairy Manufacturing
E. V. ELLINGTON	Dairy Production
C. E. TEMPLE	Plant Pathologist
C. C. VINCENT	Associate Horticulturist
H. P. FISHBURN	Assistant Chemist
C. W. COLVER	Assistant Chemist
W. R. WRIGHT	Assistant Bacteriologist
O. A. PRATT	Assistant Plant Pathologist
F. C. KINZER	Assistant Animal Husbandman
C. L. McARTHUR	Assistant Bacteriologist
C. V. SCHRACK	Gardener
W. H. OLIN	Director Sub-Stations
J. S. WELCH	Superintendent, Gooding Sub-Station
L. C. AICHER	Superintendent, Aberdeen Sub-Station
W. H. HEIDEMAN	Superintendent, Clagstone Sub-Station
RHODA HOBSON	Executive Clerk and Stenographer

The regular bulletins of this station are sent free to persons residing in Idaho who request them.