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V I R G I N I A

HORTICULTURAL SPECIALIST ... ANNUAL REPORT 1931

ANNUAL REPORT

1951

Project No. 7

VIRGINIA POLYTECHNIC INSTITUTE

EXTENSION DIVISION

HORTICULTURAL DEPARTMENT

December 1, 1950 - November 30, 1951

Part I

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COOPERATIVE EXTENSION WORK

IN

AGRICULTURE AND HOME ECONOMICS

STATE OF VIRGINIA

EXTENSION SERVICE

Blacksburg, Va.
December 31, 1951

Mr. John R. Hutcheson
Director, Extension Division
Virginia Polytechnic Institute
Blacksburg, Virginia

My Dear Director Hutcheson:

I have the honor to submit herewith, a report of extension work of the Virginia Polytechnic Institute Horticultural Department, exclusive of Vegetable Gardening, for the period beginning December 1, 1950, and ending November 30, 1951.

PERSONNEL

The personnel of the extension staff for the period covered by this report is the same as that for the last half of the year 1950, and consists of Mrs. J. B. Derryberry, Specialist in Landscape Gardening, Mr. Allen R. Reid, Landscape Gardener, Mr. D. S. Tudor, Assistant Horticulturist, Mr. J. F. Adams, Assistant Horticulturist, and A. H. Teske, Extension Horticulturist.

DIVISION OF TIME

Mrs. J. B. Derryberry is employed on a basis of three-fourths extension time and one-fourth resident instruction. Mr. Allen R. Reid is employed on a basis of full time resident instruction, but does some extension work through special arrangement.

Mr. D. S. Tudor is employed on a basis of full time extension. Mr. J. F. Adams is employed on a basis of three-fourths time extension and one-fourth resident instruction. Mr. A. H. Teske is employed on a basis of five-eighths time extension and three-eighths time resident instruction.

GENERAL DISCUSSION

As in other industries changes are constantly taking place in the business of fruit growing. While these changes are perhaps less violent than they are in some types of agriculture, it is also true that the nature of the enterprise does not lend itself readily to quick adjustments. It is, therefore, more important than ever that those who are engaged in fruit production and those who are contemplating fruit plantings be given all possible information which will help them conduct the enterprise as successfully as possible under present and future conditions.

Although there has been but little if any expansion of the fruit industry in the State during the past year, production of apples and peaches is still on the increase.

In the United States, the tendency is toward specialization. Production areas are shifting to regions of higher annual yields and lower production costs. New outside sources of production are being developed. Production of competing fruits is on the increase and at the same time greater restrictions are being placed on export shipments.

Virginia fruit growers can expect to meet stronger competition in the future as well as being confronted continuously with numerous serious problems--some new, some old, but perhaps in a different form because of different conditions as were certain problems of production of the past year which were brought on by the recent drought, or those problems which tend to bring out the economic side of the industry when purchasing power is lowered and prices decline. To meet these problems under present conditions to the best advantage of the industry, it will require the best efforts of the members of the horticultural department.

An annual program of work which will render the best service to the fruit industry of Virginia should be in line with the long time projects. In other words, the long time projects should form the basis for the yearly program with only such changes as are necessary to meet the conditions of the short period and to keep the major projects in adjustment with the trends of the fruit industry of the State and other fruit regions.

Since the major projects are on a five-year basis it is only natural that there should be a marked degree of continuity from year to year. The work covered by the period of this report is no exception and is in line with the work of former years. Considerable progress has been made in all projects.

At the beginning of the year members of the horticultural department and members cooperating departments were called to-

gether for a conference. At this meeting the work of the past and other years was reviewed. Each project was taken up separately and discussed in considerable detail in order to discover in what way any improvement could be made. After these discussions plans for the coming year were taken up and a program of work outlined. Definite projects were assigned to the individual members of the staff. The work for each project was outlined and definite goals set wherever possible. Each member became responsible for the project assigned him. This method not only places the responsibility at one point but allows for initiative and originality in developing the project.

In accordance with the above plan, the projects were assigned as designated below.

Mrs. J. B. McBryde and Mr. Allan H. Reid have been in charge of landscape gardening work.

Mr. J. F. Wahaga was put in charge of rodent control, grapes, nut fruits, topworking, grafting. He also assisted with other projects.

Mr. D. A. Tucker had charge of spraying demonstrations, grading and packing work, spray residue, small fruits (raspberries, strawberries, and dewberries), fruit products and thinning. Mr. Tucker also assisted with other projects and was given assistance with the projects named above.

Mr. A. H. Tuska supervised the policy of all projects in addition was responsible for the spray service, storages, packing houses, orchard management, pollination, pruning, and standardization, and marketing.

At the time of planning the program it was decided that the greatest efforts would be concentrated for the most part, on certain phases of a few of the most important major projects rather than to spread our time over too many projects which usually does not give the best returns for the time and effort expended.

Projects dealing largely with the problems of (1) Production (2) Standardization (3)Marketing (4) Small Fruits and Grapes (5) Landscape Gardening were elected to receive the most attention. Although such phases as spraying, pruning, fertilizers, rodent control, cultivation, thinning, pollination, packing, grading, community packing houses, spray residue, and marketing received special attention. Much time was given to the less important projects of fruit products, nuts, irrigation, stationary spray outfits, and storages. Considerable time was given to radio work and judging fairs. The projects will be taken up under their respective heads later in the report.

COOPERATION

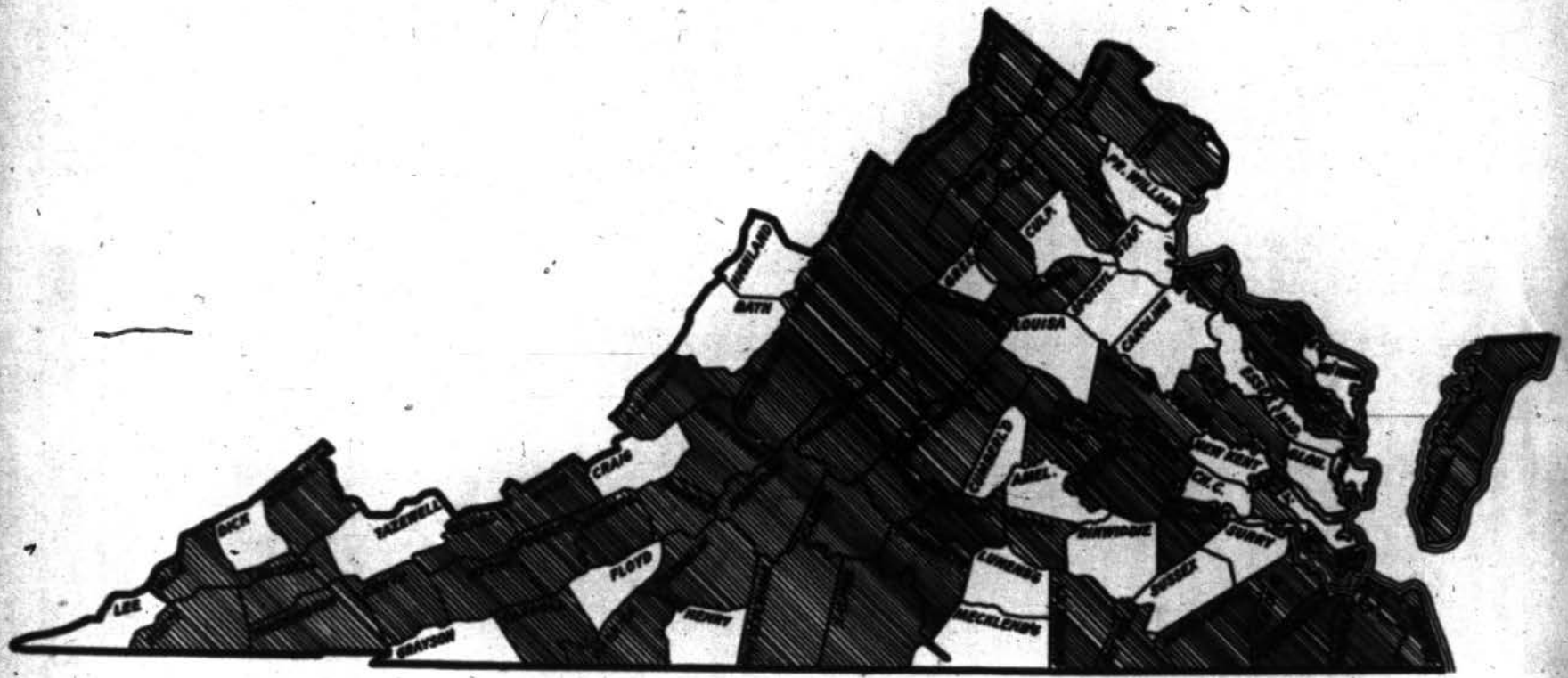
The cooperation previously established with other departments and agencies was continued and expanded. Without the cooperation from other departments and agencies it would have been difficult to have given the fruit growers of Virginia the most efficient service.

The plan of work for the long time program on which the work of this report is based follows.

PLAN OF WORK - FIVE-YEAR PROGRAM

Production	Parasite Control	Codex Application Spray Circular Spray Service Investigations Crop Pest Commission Experiment Station Aphis Curculio Leaf Roller
		Rodent Control Pruning Investigation and Demonstrations - Both Young and Old Orchards Cultural Methods - Investigation and Demonstration Thinning - Demonstration and Discussion Pollination Variety Studies - Breeding and Adaptation
	Increased Production Per Tree	
	Cost Records	A Careful Study of Production costs General Survey of Operations Complete Records, as Comprehensive as Possible of a Number of Orchards Crops Records, Variety Records Orchard Record Book
Economics		Economics of Community Packing House Comply with State Law to Fullest Extent
	Standards	To Familiarize Growers with State Standards Beverage Inspection Rings - Car Inspection
Standardization	Community Packing Houses	To Increase Efficiency of Packing Labor Saving Form of Organizing and Financing
	Packing Schools	Teaching and Demonstration

Marketing	To Assemble, Standardize, and Market by Commodity
	Furnish Complete Plan of Organization and Operation
	Investigations of Production by Acreage and Variety
	Cold Storage Facilities
	Investigation of Markets: Local
	General Domestic
	Foreign
	Study Methods to Increase Consumption
	Secure Markets for Standardized Pack
Fruit Products	By-products Plants
	Fruit Products
Expansion	Small Fruits - Production Should be Increased
	Apples - Increased Production Per Tree
	Peaches - Increased Acreage in Certain Sections



COUNTIES VISITED 1931

Tariffs, market restrictions, and increased fruit production in this and other countries means that in the future there will be greater competition between different fruits and fruit sections. Added to this, the consuming public is becoming more discriminating. Ordinary fruit offers no appeal to a public that demands quality. Fruit which attracts buyers, increases consumption, creates and widens markets, must be in a class by itself.

The problem before the grower is no longer that of growing fruit, but to grow the kind of fruit that the consuming public wants at a profit. This means that Virginia growers must increase the production of quality fruit per acre and this at a lower cost if possible than competing sections. The past season has again demonstrated that it is much easier to market quality fruit at a profit than low grade fruit. The time may even be close at hand when low grade fruit will have to be kept off the market in certain years of large crops. Inasmuch as it is necessary to produce quality fruit before it can be marketed, projects dealing with production were given special attention during the past season.

Production has been separated into several subprojects, the most important of these being (1) Spraying, (2) Pruning, (3) Cultural Methods, (4) Thinning, (5) Pollination, (6) Fertilizers, and (7) Rodent Control.

[illegible]

The work is carried out and contacts made through the office of the county agent, it is, therefore, natural that our efforts are concentrated in counties that have agents, as more people can be reached through group action and the specialist's time can be used most efficiently.

When the requests for the services of a specialist come from counties where there is no agent, our effort is made to work through some other organized group or prominent grower in order that the need for an agent may be pointed out. The object being to get the work organized in such a way that personal service may be reduced as much as possible.

Since so much more work can be accomplished through a centralized office, it is up to the department to sell its services to the county agent. The procedure then in putting the work across is first of all for the specialist to sell himself and his work to the county agent in those counties where there is the greatest need and the greatest benefits can be secured from certain project work. The next step is to go over the project with the agent in detail, lay plans for demonstrations

and meetings which will put the project across in the most successful manner.

Demonstrations and field meetings have been used as much as possible in getting the subject matter over to the growers. Fruit growers' meetings, group conferences, visits, news articles and radio talks have been used to supplement the above mentioned demonstrations and group meetings.

Our goal has been to get the greatest number of growers to use the best production methods.

Spray Project - A. E. Tenke in Charge. Spraying is one of the most important phases of production. The spray project consists of three parts: (1) the spray service, (2) spraying demonstrations, and (3) demonstration plots.

Fruit growing in Virginia can be considered as a big business enterprise. In 1931 the commercial peach crop amounted to over 1,440,000 bushels and the commercial apple crop amounted to over 5,200,000 barrels. These two fruits alone return many millions of dollars to the producers each year besides income from grapes, small fruits, and nuts which run up the total several millions more. Fruit production is still on the increase. However, like any other big business, success in fruit growing depends upon the economic production and profitable sale of its product. It is, therefore, important that Virginia fruit growers put on the market fruit which is free from scab, worms and dirt. In other words, clean fruit, and this cannot be done unless trees are properly sprayed.

Weather conditions in 1930 were favorable to insect development, especially scale and codling moth. Early field inspections showed that in many orchards scale and worm infestation was on the increase. Chances were also in favor of more trouble from diseases.

In 1930 foreign countries placed embargoes against scale and disease infested fruit and fruit of low grade and inferior quality, and indications were that the same restrictions would be in force in 1931.

Again no business enterprise can remain solvent under a system of operation which permits a large per cent of its out put to go into seconds or culls. With these conditions in mind it was decided at the time of planning the program of work that considerable time would be devoted to the spray project. Efforts were still further increased later in the

season when reports showed that a large crop of fruit was in prospect; together with a downward trend in prices because of the low purchasing power of the public.

The Spray Service Spraying is one of the most important operations in the production of clean fruit. It is at the same time, one of the most costly orchard operations. If it is not done in a thorough manner, with proper materials, and at the proper time, a large amount of cull fruit, a loss in time and money, are the results.

New materials are constantly being offered to growers by manufacturers with claims for better control at lower cost. In times of stress such as we are experiencing at the present time, growers are especially apt to take chances. At such times the extension staff can render a very important service.

The object of the spray service is to supply Virginia fruit growers with the most reliable information on developments in spraying and spraying practices. The service furnishes recommendations on proper materials, proper equipment, proper application and time to apply the various sprays and materials in the different fruit sections of the State.

The goal of the horticultural extension workers is to place in the hands of every fruit grower in the State information which will enable him to produce clean fruit.

The Spray Program At the beginning of the year a detailed spray program is prepared for each important fruit grown in the State by the departments of Plant Pathology, Entomology, and Horticulture. The program is based upon the best experimental results secured by the research workers in the States of Virginia, West Virginia, and Maryland. The spray calendar is prepared in bulletin form (see exhibit) and is sent to all fruit growers in the State previous to the beginning of the spraying season.

Spray Notice Cards Supplementing the recommendations given in the spray bulletin, spray notice cards are prepared and sent out a short time before the respective sprays are to be applied. Recommendations in the spray calendar serve as a general guide. The spray notice cards give more specific information to conform to seasonal and economic conditions.

In preparing these cards the State is divided into several spray districts in which climatic conditions are similar. During the spraying season daily and weekly reports are received from these districts giving climatic changes and insect and disease developments. (See exhibit.) As soon as these reports are received a conference is held, consisting of the heads of the departments mentioned above. At these conferences, the reports are studied

in detail and checked with what has taken place in previous years under like conditions, and definite recommendations are then decided upon. The cards are printed, addressed, and forwarded to the county agent. Exact dates for each spray in each district are furnished the county agent from this office. Upon receiving this information, the agent inserts the date, signs the cards, and mails them promptly to the grower. In counties where there is no agent, the spray notice cards are mailed directly from this office.

Growers' mailing list The county agents prepare and keep the mailing list up to date. Each year before the spraying operations begin the old lists are returned to the agents for revision. The outstanding success of the spray service project has been due to the active interest the county agents have taken in the project. From the letters received and the number of new names added to the list each year, we are led to believe that the growers think well of the service. That growers are using and depending to a great extent on these notices for timing their sprays can be judged by the letters and inquiries which come into the office when the notices do not go out on time, are delayed, or miscarried in the mails.

Previous to 1930, the spray service was only available for the apple growers. In 1930 a similar service was offered the peach growers, and was given as a response to many requests on the part of the peach growers and county agents following the severe losses from scabs and spray injury in 1929. In 1931 the service was continued upon request of the growers. The results have been very gratifying. What the growers think of the service is indicated by the fact that during 1931 seven hundred names were added to the apple growers mailing list and about three hundred and fifty to the peach growers mailing list.

Spray Service by Radio The radio spray service was continued in 1931. This consisted of giving timely information on weather conditions, bud development, and insect and disease development for apples and peaches, over the radio. This department is one of the few departments in the United States to broadcast timely spray information to fruit growers.

Spray Service Accomplishments

8,000 copies of spray bulletin distributed
37 conferences held to determine proper spraying dates
7 apple spray notice cards prepared
3 peach spray notice cards prepared
38,200 spray notice cards sent out

Outlook Water shortage in 1930 together with favorable development of insects notably scale and codling moth, increased the

Bulletin No. 123 February, 1921

Information

FOR

Virginia Fruit Growers

Prepared by Departments of Horticulture,
Plant Pathology and Entomology

Spraying with a tractor power take-off orchard sprayer. The use of these tractor outfits is increasing

VIRGINIA AGRICULTURAL AND MECHANICAL COLLEGE AND POLYTECHNIC INSTITUTE
AND THE UNITED STATES DEPARTMENT OF AGRICULTURE, COOPERATING
EXTENSION DIVISION, JNO. R. HUTCHESON, DIRECTOR
BLACKSBURG, VIRGINIA

DISTRIBUTED IN FURTHERANCE OF THE ACTS OF CONGRESS OF MAY 8 AND JUNE 30, 1914.

Assistance That Can Be Rendered by the Extension Division of The Virginia Polytechnic Institute

The Extension Division carries the Agricultural College and United States Department of Agriculture to the farmer and farm home. It endeavors to meet their problems in soils and crops, horticulture, dairying, live stock, poultry, agricultural engineering, home economics, agricultural economics, and community development. This is done by personal visits, meetings, and correspondence of County Farm and Home Demonstration Agents and Specialists, through boys' and girls' and women's club work, cow testing and purebred live stock and other associations and organizations, and the distribution of bulletins, circulars, newspaper articles, etc.

Application for information or assistance with any farm or home problem should be made to the Director of the Extension Division, Blacksburg, Virginia.

Extension Division Staff

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JOHN R. HUTCHESON ..... *Director*
W. P. MOORE ..... *Assistant Director*
MISS MAUDE E. WALLACE ..... *State Agent*
L. C. BEAMER ..... *Asst. Garden Specialist*
W. H. BYRNE ..... *Agronomist*
MISS JANET CAMERON ..... *Food Specialist*
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W. H. DAUGHTREY ..... *Asst. Agronomist*
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H. N. YOUNG ..... *Assistant Agricultural Economist*

CONTENTS

Information for Virginia Fruit Growers

INTRODUCTION

Fruit growing in Virginia is a big business enterprise. Like any other big business, its success depends upon the economic production and profitable sale of a commodity, which in this case is fruit. High yields per acre are essential to economic production. This can be secured only by proper pruning, thinning, and fertilization, and by the use of proper soil management methods which will increase the organic matter and improve the physical condition and water holding capacity of the soil. It is also necessary to produce the kind of fruit which will command the attention of a discriminating consuming public. It is, therefore, important that fruit growers put on the market fruit which is free from scab, worms, and dirt; in other words, **clean fruit.** Growers cannot market clean fruit without first producing it. **This cannot be accomplished unless the trees are properly sprayed.**

The spray schedules, particularly the one pertaining to apples, contained in this bulletin, are basically the same as those published by the states embracing the Shenandoah-Cumberland region: Virginia, West Virginia, Maryland, and Pennsylvania. To correlate recommendations and to provide for a uniform schedule, workers in these states have met at certain times to work out a joint calendar, the contents of which would be applicable to orchardists in any of these states. In substance they are identical, but local conditions have made it necessary to make a few minor changes.

Inasmuch as the orchards in the state of Virginia represent a wide range in altitude, cultural practices, and types of soil, it is not possible to formulate a spray calendar that will meet the requirements of each individual orchard in every detail. It can, therefore, only serve as a guide to the season's operations. If the individual grower is to secure the best results from the recommendations given, the details must be worked out to fit the conditions found in his particular orchard.

The information contained in this bulletin should prove of value to the orchardist by helping him to produce clean fruit. It is based upon the results of scientific investigations and practical orchard experiences, and is in keeping with progress of the changing times. The aim is to give Virginia growers a spray calendar which will be of the greatest benefit to them. The authors feel sure that if the recommendations regarding the time of application, manner of application, and materials to be used are followed carefully, Virginia growers will be able to produce a high percentage of clean fruit.

THREE MAIN CONSIDERATIONS IN SUCCESSFUL SPRAYING

The three main considerations in successful spraying are **correct timing, thorough application,** and the use of **proper materials.** Timeliness of application is probably the most important, because a thorough application of the proper materials at the wrong time will fail to produce results. Proper and adequate equipment, advance preparation, and the use of the recommended amounts of the very best spray materials available are absolutely essential to success.

Due consideration was given the arsenic residue situation as well as insect control in the preparation of these recommendations.

When spray materials other than those mentioned in the schedules have been properly tested and found superior they will be recommended by the Spray Service.

THE VIRGINIA SPRAY SERVICE

The information of the Spray Service is disseminated under the direction of the State Extension Division and is governed by the information furnished by the Experiment Station. The spray notices are sent out from Blacksburg to the county agents, fruit growers' organizations, and authorized indiyiduals who fill in the dates of application and mail them to the growers. Every fruit grower in Virginia is privileged to receive this spray service information free of charge. Those not receiving same and desirous of so doing should notify the Spray Service at Blacksburg.

The spray notice cards call attention to the name and number of the spray (which corresponds to the schedule found on p. 7), materials to be used, time to apply the spray, and the insect pests and fungous diseases to be controlled. The actual dates of application will be given for sprays No. 4, 5, and 6. The time to apply sprays No. 1, 2, and 3 will refer to the stage of bud, blossom, and fruit development; spray No. 1 referring to first showing of green in blossom buds, No. 2 referring to the pink bud, and No. 3 to the time of petal-fall. Because of variation in development due to varieties, soil, and climatic conditions, growers are in the best position to gauge the time of these applications. Sprays No. 4, 5, and 6 will be governed by reference to the time of the beginning of the petal-fall spray and the brood development of the codling moth. These are known as the 3-weeks, 5-weeks, and mid-summer sprays, respectively.

Careful attention to each recommendation made on the spray notice card is essential to the success of the season's program. Each one is designed for a specific purpose and would not appear if it could be safely omitted.

DISCUSSION OF THE SPRAY CALENDAR FOR APPLES

Since apple growing is the most important branch of the Virginia fruit growing business, the following is the most important of the spray calendars. Every apple grower should familiar-

VIRGINIA APPLE SPRAY PROGRAM

	NAME	TIME	MATERIAL FOR 100 GALLONS OF SPRAY	PURPOSE
1	DELAYED DORMANT	When green can first be seen in blossom buds.	Lime sulphur, 32° Baume, 12 gallons, and nicotine 1 pint. Oils may be used at 3% strength, and are recommended for scale and red mite control.	Scales Aphids Red mite
2	PINK	When the majority of the cluster buds have separated. *	Lime sulphur, 32° Baume, 10 quarts. When curculio is present include lead arsenate 3 pounds.	Scab Mildew Leaf spot Curculio Bud moth
3	PETAL-FALL	When most of the petals have fallen.	Lime sulphur, 32° Baume, 10 quarts, and lead arsenate, 3 pounds. (Nicotine 1 pint only when red bug is known to be present.)	Scab Mildew Leaf spot Codling moth Curculio Leaf roller and other chewing insects (Red bug)
4	3 WEEKS' SPRAY	About three or four weeks after the petal-fall stage or as advised by the Spray Service.	Lime sulphur, 32° Baume, 10 quarts, and lead arsenate, 3 pounds, or Bordeaux 4-8-100, as advised by Spray Service.*	Scab Frog-eye Mildew Blotch Curculio Codling moth
5	5 WEEKS' SPRAY	About five or six weeks after petal-fall stage as advised by Spray Service.	Lead arsenate, 3 pounds, in 4-8-100 Bordeaux, as advised by Spray Service.	Codling moth and other chewing insects Blotch Bitter rot
6**	MID-SUMMER SPRAY	About first week in July as advised by Spray Service.	Lead arsenate, 3 pounds, in 4-8-100 Bordeaux, as advised by Spray Service.	Codling moth and other chewing insects Blotch Bitter rot

* Choice of material in this spray is governed by weather conditions. If it is hot, 85 degrees or over, use Bordeaux as recommended. If it is cool, use lime sulphur. About six pounds of hydrated lime should be used in each 100 gallons of spray solution whenever lead arsenate is combined with lime sulphur. Spray lime is preferable.

** Growers who apply an arsenical spray in July must be prepared to remove any excessive residue that may persist at picking time. SPRAY No. 6 is very important where late worm injury is a factor.

ize himself with the name, the number, and the materials used for every spray, and the specific diseases and insect pests to be controlled by them. For a fruit grower to be successful, a working knowledge of these fundamentals is essential and too much emphasis cannot be laid upon its importance.

The following discussion is prepared for the purpose of informing the grower about the materials used, the purpose of each spray, and the facts governing the timing of these sprays.

Spray No. 1 (Delayed Dormant). This spray should be applied in every apple orchard. Application should be most thorough in order to control aphis and scale on the tree. The scales are usually found under the edge of loose bark or in depressions in the bud where they are protected. Unless they are actually covered by the spray material they will not be killed. Whenever scale insects are found under the large bark scales on the trunk of a tree, it becomes necessary to remove this bark before spraying. Trees should be examined to determine whether this condition exists. It is a good plan to scrape away the loose bark from the trunk and larger limbs.

Buds Ready to Receive Delayed Dormant Spray

Sprays No. 2 and 3 (Pink and Petal-Fall). The explanations given in the calendars for these sprays need not be amplified except to emphasize the value of the pink and petal-fall sprays as the most important for scab, leaf spot, and codling moth. Both the pink and petal-fall sprays are absolutely essential for scab control because they are applied when the first infections occur. The first brood of the codling moth appears shortly after the petal-fall application is made and to control codling moth it is essential to kill the first brood.

Time for the Pink Spray

Spray No. 4 (Three-weeks Spray). This spray takes the place of the old ten-days spray. It should be applied about three weeks after the beginning of the petal-fall spray or as determined by the Spray Service. It should be applied to all varieties, as it is important for scab, frog-eye, mildew, curculio, and codling moth.

Spray No. 5 (Five-weeks Spray). This spray must be applied in every orchard about five weeks after the beginning of the petal-fall spray. It is important for codling moth and where bitter rot and cloud are prevalent, as first infections may appear at this time.

Blossoms in Ideal Condition for Petal-fall Spray

Spray No. 6 (Midsummer Spray). This spray will be recommended for every orchard as it will be the last application which can be made with safety. Because of bitter rot and blotch it is important. For most effective control of second brood worms this spray should usually be applied during the latter part of July.

SPRAY RESIDUE

Experience warns us that an arsenical application made in July, and especially after July 10, will necessitate some means of removal of excessive residue at picking time. If lead arsenate is omitted and nothing but Bordeaux mixture is applied for control of bitter rot and cloud in July, preparation must be made to remove the visible residue that may persist at picking time. Fruit must pass a visibility inspection as to residue as well as meet a chemical tolerance.

Supplementary Sprays. In the event of a possibility of late infection of cloud, bitter rot, Phoma spot, or other late seasonal diseases, Bordeaux mixture 4-8-100 may be required in addition to the regular program. See note above on spray residue.

DILUTION TABLES FOR LIME-SULPHUR

Experience in preparing lime-sulphur concentrate shows that this product varies in specific gravity as indicated by its Baume test. This is due to the variation in the quality and quantity of the sulphur and lime used, also to the length of the boiling period. The formulas given in this bulletin are calculated to produce lime-sulphur that will test approximately 32 degrees Baume. This is what is known as standard lime-sulphur concentrate.

Dilution Rates for Winter Spraying

Specific gravity	Baume test of concentrate in degrees	No. of gals. of water for each gallon of lime sulphur	AMOUNT IN GALLONS TO USE IN			Baume test of diluted solution
			50 gal. tank	100 gal. tank	200 gal. tank	
1.318	35	8.5	5¼	10½	21	About 5
1.306	34	8.1	5⅓	11	22	" 5
1.295	33	7.7	5⅝	11⅓	23	" 5
1.283	32	7.3	6	12	24	" 5
1.272	31	7	6¼	12½	25	" 5
1.261	30	6.7	6⅔	13	26	" 5
1.250	29	6.4	6⅞	13½	27	" 5
1.239	28	6.14	7	14	29	" 5
1.229	27	5.9	7¼	14½	29	" 5
1.218	26	5.67	7½	15	30	" 5
1.208	25	5.25	8	16	32	" 5
1.198	24	4.9	8⅓	17	34	" 5
1.188	23	4.7	8½	17⅔	35	" 5
1.179	22	4.4	9⅛	18¼	37	" 5

Dilution Rates for Summer Spraying

Specific gravity	Baume test of concentrate in degrees	Rate of dilution	AMOUNT IN QUARTS TO USE IN			Baume test of diluted solution
			50 gal. tank	100 gal. tank	200 gal. tank	
1.318	35	1 to 45	4½	9	18	1.25
1.306	34	1 to 43½	4⅝	9⅓	19	1.25
1.295	33	1 to 41½	5	10	20	1.25
1.283	32	1 to 40	5	10	20	1.25
1.272	31	1 to 37½	5⅓	10⅔	21	1.25
1.261	30	1 to 35½	5⅝	11⅓	23	1.25
1.250	29	1 to 34½	5⅞	11½	23	1.25
1.239	28	1 to 32½	6	12	24	1.25
1.229	27	1 to 31	6⅓	13	26	1.25
1.218	26	1 to 29½	6⅔	13⅓	27	1.25
1.208	25	1 to 27½	7⅓	14⅔	29	1.25
1.198	24	1 to 26	7½	15	30	1.25
1.188	23	1 to 24¼	8	16	32	1.25

Whenever this concentrate is above or below the standard the accompanying dilution tables are necessary to determine how much of the concentrate should be used for the winter and summer spray mixtures. The table indicates these amounts for lime-sulphur concentrate, varying in test from 22 to 35 degrees Baume.

The most satisfactory procedure is to test the diluted mixture in the spray tank. This is done with an especially sensitive hydrometer. Using such a hydrometer, the reading for the winter strength spray material in the spray tank should be about 5 and the summer strength material 1.25 degrees Baume.

AMOUNT OF SPRAY SOLUTION REQUIRED FOR TREES OF VARIOUS AGES

The harvest season and the cull pile offer the best opportunity to check up on the efficiency of our spray program and its application. Poor results can usually be traced to one or all of three things — namely, use of the wrong material, incorrect timing, or poor and insufficient application. As a rule, the use of insufficient material causes most of our troubles. It is poor economy to at-

tempt to skimp on material; on the other hand, it is poor business to waste it. Trees of various sizes and ages require a definite amount of material to cover them properly. Unless it is definitely known how much spray solution is required by trees of different ages, it is difficult to know how much material to buy or how to check up on the men doing the work. The following table will aid in determining how much material to buy and whether too much or too little is being used on the trees. Trees of normal size should receive approximately the following amounts of diluted spray solution for thorough spraying.

AMOUNT OF SPRAY MATERIAL REQUIRED FOR TREES OF VARIOUS AGES

AGE OF TREES	APPLE TREES	PEACH TREES
1 to 3 years	½ to ½ gallon	½ to 1 gallon
3 to 5 years	½ to 2 gallons	1 to 2 gallons
5 to 6 years	2 to 3 gallons	2 to 2½ gallons
6 to 8 years	2½ to 4 gallons	2½ to 4 gallons
8 to 12 years	3 to 5 gallons	3½ to 5 gallons
12 to 18 years	5 to 8 gallons	4 to 6 gallons
18 to 25 years	6 to 12 gallons	4 to 6 gallons
25 years and older	12 to 15 gallons	

For the dormant spray less material will be required. The above table is for trees in full foliage.

HOW TO ESTIMATE AMOUNT OF MATERIALS TO BUY

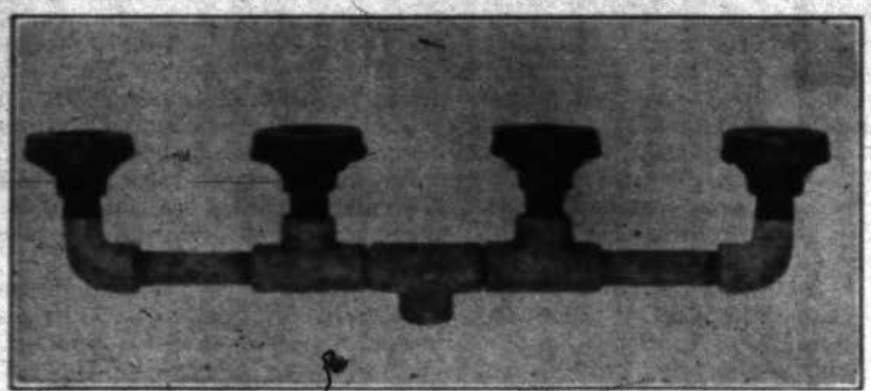
In order to estimate the amount of lime-sulphur needed for the season, multiply the number of trees of the same age by the quantity of solution estimated per tree, then multiply this by the number of applications to be applied. For the dormant spray 24 gals. of concentrate material testing 32 degrees Baume is required for each 200-gal. tank. For 1,000 trees eight years old about 3 gals. of dilute material will be required for each tree. Three thousand gallons would require 15 tanks. Fifteen tanks would require 360 gals. or 7 bbls. Three summer sprays would require 15,000 gals. of dilute material. Diluted 1-40, 5 gals. of concentrate would be required for each 200-gal. tank. Fifteen thousand gals. equals 75 tanks, 375 gals. of concentrate or 7 bbls. For this orchard 15 bbls. of concentrate lime-sulphur solution should be purchased.

In estimating arsenate of lead, multiply the number of trees of the same age by the quantity estimated in the table for trees of that age; multiply by the number of applications to be used, dividing the total by 100, which will give the number of 100-gal. tanks required to spray the orchard; next multiply this by 3 which will give you the number of pounds of powdered lead arsenate to order.

A CALENDAR OF IMPORTANT EVENTS IN THE APPLE GROWING SEASON

The following table is of special interest to apple growers in the Winchester and Valley sections, because it contains facts which

EVENT	1926	1927	1928	1929	1930
DELAYED DORMANT SPRAY	Mar. 30-Apr. 17	Mar. 16-Apr. 5	April 4-14	Mar. 25-Apr. 2	Mar. 28-Apr. 7
First rosy aphis	April 4	Mar. 18	April 3	Mar. 23	Mar. 18
PINK SPRAY	April 28-30	April 13-18	April 24-29	April 5-7	April 12-16
Mildew on apple	May 7	May 1	May 6	----------	April 18
PETAL FALL SPRAY	May 19-22	May 4-13	May 11-21	Apr. 23-May 2	May 2-10
Frog-eye	May 27	May 1	May 7	May 1	May 11
Cedar rust	May 30	May 10	May 10	May 1	May 29
Scab	June 5	May 12	May 20	May 10	May 7
THREE WEEKS' SPRAY	May 29-June 5	May 26-June 6	June 1-9	May 14-23	May 20-31
First codling moth larvae	May 29	May 30	June 1	May 18	May 16
Rosy aphis leaving apples	May 30	May 19	May 30	May 18	June 8
Max. egg laying, 1st brood codling moth	May 17-25	June 10-22	June 1-5	May 24-June 6	May 25-June 18
Apple blotch	June 23	June 13	June 10	----------	June 25
Rose chafer	June 10	----------	----------	----------	May 31
FIVE WEEKS' SPRAY	June 18-July 4	June 13-17	June 18-23	June 3-10	June 10-18
Black rot	June 17	July 7	July 8	----------	----------
Bitter rot	June 30	July 18	July 6	----------	Aug. 2
Max. egg laying, 2d brood codling moth	Aug. 30	Aug. 6-13	July 28-Aug. 1	July 26-Aug. 8	July 19-Aug. 7
Cloud or sooty blotch	Aug. 4	Aug. 15	Aug. 7	----------	Oct. 29
MID-SUMMER SPRAY	July 23-31	July 1-7	July 5-14	June 24-29	July 10-19
Max. egg laying, 3d brood codling moth	Sept. 4-8	----------	None	Aug. 25-28	Sept. 1-3
Max. activity of leaf roller	----------	----------	Sept. 1-15	Sept. 1-10	Sept. 1-20



Four-nozzle head. Ten inches from center to center of outside nozzles. All nozzles with six holes in whirl disc. This type of nozzle head can now be obtained from several companies making spray equipment.

will enable them to anticipate in a general manner the succession of diseases, insect pests, and sprays for the 1931 season. With slight variations in time, this outline also applies to other apple growing sections of Virginia. The seasonal climatic differences during 1926, 1927, 1928, 1929, and 1930 varied extremely, yet the appearance of the different diseases and insects has been quite constant. This indicates that the table may be used with considerable accuracy in predicting these events for 1931.

Spraying with a machine of 20 gallons-per minute capacity

SPRAY CALENDAR FOR PEACHES

One of the most important points to be observed in spraying peaches is to use rods with angle nozzles instead of guns with high pressure. In order to properly spray a peach tree, especially when it is in heavy foliage, it is necessary to use from 200 to 225 pounds pressure with rods carrying angle nozzles. The spray should be directed upward and outward from the center of the tree. A peach tree cannot be properly sprayed by simply spraying from the outside of the tree; it must be sprayed from the center outward to the tips of the limbs.

The following materials may be used as fungicides on peaches: Dry mix, either formula; self-boiled lime and sulphur; and calcium sulphide. The zinc-lime spray, or zinc Bordeaux, is not intended as a fungicide but as a control for bacteriosis, and the prevention of arsenical injury to the twigs and foliage.

Arsenical injury and bacteriosis have become serious problems in the last few years and zinc Bordeaux is recommended as the most promising material now known for their prevention.

When this material is used for the control of bacteriosis, 5 to 7 applications are necessary. The first application should be made as soon as the petals have fallen; the others at two-week intervals thereafter. When bacteriosis is not a problem, the zinc Bordeaux may be used only in the lead-arsenate applications. The zinc Bordeaux may be used with the common fungicides such as calcium sulphide; dry mix, either formula; and self-boiled lime and sulphur. In case these fungicides are used with zinc Bordeaux, they should be added after the zinc-lime material has been prepared in the spray tank. When lead arsenate is used with the zinc-lime spray alone, or in combination with fungicides and the zinc-lime spray, it should be added last. The directions for preparing the zinc-lime spray, or zinc Bordeaux, are given on page 21.

In orchards where early infection by the brown rot fungus has occurred, resulting in the blighting of the blossoms and dropping of the small fruit, apply one of the summer fungicides when pink begins to show in the buds. Early blossom blight, however, is not common in Virginia, and unless it has been prevalent in the orchard in previous years, follow the regular schedule. The practice of removing the mummies from the trees and ground is a very important measure in the control of the early blight form of brown rot, as well as for the control of brown rot of the mature fruit. Orchard sanitation for the control of both insects and diseases cannot be over-emphasized.

SPRAY CALENDAR FOR PEACHES

NO.	TIME OF APPLICATION	MATERIALS TO USE	PARASITES
1	Dormant season (before buds have commenced to swell), February or early March.	Lime-sulphur, 32° Baumé, 12 gallons; add water to make 100 gallons of spray. If oil emulsion is used for scale, it should be used with 3-3-50 Bordeaux mixture for the control of leaf curl. Lime-sulphur, however, may be used with the lignin pitch home-made oil emulsions. If lime-sulphur is used with lignin pitch oil emulsion, it should be used at the rate of 1 to 15 for the control of leaf curl.	Scale Leaf curl
2	Immediately after the petals drop.	Two pounds of powdered lead arsenate to 100 gallons of water; add 8 pounds of freshly slaked lime or 10 pounds of hydrated lime to each 100 gallons of solution. If the zinc Bordeaux is used at this time the lead arsenate should be added to the zinc Bordeaux after it has been prepared in the spray tank, no extra lime being used. The lime in the zinc Bordeaux will be sufficient.	Curculio
3	One week after No. 2.	No. 3 same as No. 2	Curculio
4	Three weeks after No. 3.	Self-boiled lime and sulphur; or 16 pounds of dry mix, either formula; or 12½ pounds of calcium sulphide, to each 100 gallons of water. Add two pounds of powdered lead arsenate to each 100 gallons of water. Zinc Bordeaux may be used with the above fungicides. Use same amount of lime as in No. 2.	Curculio Scab
5	One month before fruit ripens.	Self-boiled lime and sulphur, or 16 pounds of dry mix, or 12½ pounds of calcium sulphide, to each 100 gallons of water. Zinc Bordeaux may be used with the above fungicides.	Scab Brown rot
6	For late varieties only; three weeks after No. 5.	No. 6 same as No. 5.	Brown rot

SPRAY CALENDAR FOR CHERRIES

NO.	TIME OF APPLICATION	MATERIALS TO USE	PARASITES
1	Dormant season.	Lime-sulphur, 32° Baume, 12 gallons; add water to make 100 gallons of spray.	Scale
2	Immediately after petals fall.	Lime-sulphur, 32° Baume: *Sour Cherry*, 12 quarts, and water to make 100 gallons of spray. *Sweet Cherry*, 16 quarts, and water to make 100 gallons of spray. Add 2 pounds powdered lead arsenate to each 100 gallons of solution.	Leaf spot Curculio
3	One week after No. 2.	Same as in No. 2.	Leaf spot Curculio
4	Three weeks after No. 3.	Same as in No. 2.	Leaf spot Curculio Brown rot
5	Immediately after fruit is harvested.	Same as in No. 2, but omit the lead arsenate.	Leaf spot

SPRAY CALENDAR FOR PLUMS

NO.	TIME OF APPLICATION	MATERIALS TO USE	PARASITES
1	Dormant season.	Lime-sulphur, 32° Baume, 12 gals.; add water to make 100 gallons of spray.	Scale and general clean-up
2	As soon as petals fall.	Lime-sulphur, 32° Baume, 12 quarts, and water to make 100 gallons of spray; add 2 pounds powdered lead arsenate to each 100 gallons of solution.	Curculio Leaf spot
3	One week after No. 2.	Same as in No. 2.	Curculio Leaf spot
4	Three weeks after No. 3.	Same as in No. 2.	Curculio Leaf spot
5	One month before fruit ripens.	Self boiled lime and sulphur.	Brown rot and other fungus diseases

SPRAY CALENDAR FOR GRAPE

NO.	TIME OF APPLICATION	MATERIALS TO USE	PEST
1	Dormant season.	Lime-sulphur, 32° strength, diluted 1 to 8.	Scale and general clean-up
2	When second or third leaf shows.	Bordeaux 4-5-50.	Anthractose Bitter rot Black rot Mildew
3	Before blossoms open.	Same.	Same
4	After blossoms fall.	Same.	Same
5	Ten to fourteen days later.	Same.	Same
	Then at two week intervals until within two weeks of harvest time.	Same.	Same

Lead arsenate, 2 pounds powder to each 50 gallons of solution, should be combined with Bordeaux if chewing insects make an appearance.

Burgundy mixture may be substituted for Bordeaux in the last spray in order to prevent discoloring of the fruit. The following formula is suggested:

Sodium carbonate (Sal soda)	6 lbs.
Copper sulphate	4 lbs.
Water	50 gallons

Prepare and apply same as Bordeaux.

SPRAY CALENDAR FOR RASPBERRIES AND BLACKBERRIES

Anthracnose causes cankers on the canes of the raspberry and blackberry. It is the most important disease of bush fruits

NO.	TIME OF APPLICATION	MATERIALS TO USE	PEST
1*	In spring just after growth begins.	5¼ gallons commercial lime-sulphur in 50 gals. water and ½ pound calcium caseinate.	Anthracnose
2	One week before bloom.	1 gallon commercial lime-sulphur in 50 gals. water and ½ pound calcium caseinate.	Anthracnose

*Spray No. 1 should be applied after growth begins but not after the leaves have reached ½ inch in length.

in Virginia and can be effectively controlled by the application of two lime and sulphur sprays according to the accompanying calendar. The addition of a casein spreader at the rate of ½ pound to 50 gallons of spray material is necessary to secure control.

SPRAY CALENDAR FOR STRAWBERRY

NO.	TIME OF APPLICATION	MATERIALS TO USE	PEST
1	When growth begins.	Bordeaux mixture, 4-5-50 formula.	Leaf spot
2	Before blossoming.	Same.	Same
3	Just after blossoming.	Same.	Same
4	After leaves have been mowed and burned.	Bordeaux mixture plus 1 pound lead arsenate to each 50 gallons Bordeaux.	Leaf spot Flea beetle

Should leaf roller appear, or if it has been prevalent, add lead arsenate at rate recommended in No. 4 spray in each application.

METHODS OF PREPARING SPRAY MATERIAL

Every fruit grower should be familiar with the methods of preparing such spray materials as are used in his orchard. The following discussion indicates the methods of preparing and using spray materials with special emphasis on the use of certain insecticides, such as lead arsenate, nicotine sulphate, and oil emulsions.

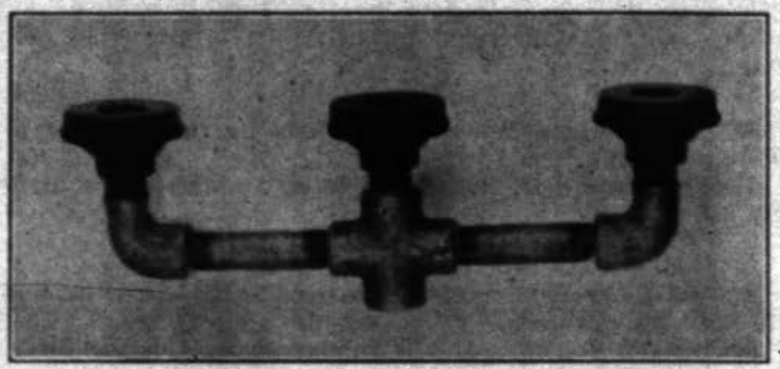
Concentrated Lime-Sulphur

Two formulas are in general use. The first of these requires 50 pounds of lump lime, 100 pounds of sulphur, and 50 gallons of water. The second formula requires 62½ pounds of lump lime, 125 pounds of sulphur, and 50 gallons of water. The second formula will produce a concentrate with a higher test than the first. Both formulas are good.

Preparation. Slake the lime with 15 to 20 gallons of water in the container in which the boiling is to be done; add the sulphur and increase the amount of water to 50 gallons, and boil for one hour. Stir constantly and keep water up to 50 gallons. Strain the

solution through a brass strainer as it is poured into barrels or reservoir. The container should be sealed tightly. Hydrated lime may be used instead of lump lime, but the amount used must be one-third more by weight than the lump lime.

Testing. Lime-sulphur concentrate should be tested only when it is cool. By using a Baume hydrometer, procurable at most hardware stores, the test can be made and the figures recorded plainly on the head of the barrel. The standard strength of lime-sulphur concentrate is 32 degrees Baume. The Baume test is simply an indication of the specific gravity of the concentrate compared with that of water. It is necessary to know the test of every barrel of concentrate in order to determine the amount to be used for winter and summer spraying.



Three-nozzle head. Seven and one-half inches from center to center of outside nozzles. All nozzles with six holes in whirl disc. This type nozzle head can now be obtained from several companies making spray equipment.

Dilution. Standard lime-sulphur concentrate is diluted at the rate of 1 part to 7.3 of water for winter spraying and 1 part to 40 for summer spraying. When the test is not standard, the rates of dilution are given in the dilution tables on page 10.

Caution. Lime-sulphur will not kill chewing insects and it will not control bitter rot of apples. It should not be used as a late summer spray on apples because it is liable to cause spray burn. Concentrated lime-sulphur should never be used on peaches during the growing season.

Bordeaux Mixture

Bordeaux mixture is the most effective fungicide for certain diseases, particularly apple blotch and bitter rot. It is commonly used as a mid-season spray for apples.

Two methods of preparing Bordeaux mixture are now in use. The new method of using powdered ingredients has certain advantages over the old one of using stock solutions. Both methods are described in the following paragraphs.

New or Instant Method of Preparing Bordeaux Mixture

Materials:

1. Finely powdered copper sulphate (bluestone). This material should be as fine in texture as a high grade of table salt, or fine granulated sugar.

2. Hydrated spray lime. A hydrated lime which is of such fineness that most of it will pass through a 300-mesh sieve; lime low in magnesium but carrying a very high content of active calcium hydroxide; a lime free from grit and coarse materials. Such lime is sometimes spoken of as chemical hydrated lime. Agricultural, mason's and finishing limes are not always satisfactory for use in preparing Bordeaux mixture. Hydrated spray lime does not refer to any particular brand of lime, but to any hydrated lime which meets the requirements mentionel above as to fineness of particle, calcium hydroxide content, and freedom from grit and coarse particles.

3. Water.

Steps in making Bordeaux mixture on the basis of a 200-gallon spray tank:

1. Weigh out 8 lbs. powdered bluestone and 16 lbs. hydrated spray lime.
2. Fill spray tank one-fourth full of water.
3. Start the agitator (be sure agitator is working).
4. Add powdered bluestone by pouring in slowly or washing it through the strainer.
5. Add water until tank is three-fourths full (agitator running).
6. Add hydrated spray lime, either in dry form or as a thick paste.
7. Fill tank and allow engine to run a minute longer.

If arsenate of lead is used, it should be added last.

Vigorous agitation is essential. If the agitator is not functioning properly, spray the mixture back on itself through the use of the rod or gun.

Old Method Bordeaux Mixture

Bordeaux mixture is produced when dissolved copper sulphate (blue stone) and milk of lime are poured together. A chemical reaction takes place between them which results in the formation of a voluminous precipitate.

Formulas are generally designated by the proportion of materials used. For example: 4-8-100 formula =

Copper sulphate (blue stone)	4 lbs.
Calcium oxide (stone or quick lime)	8 lbs.
Water	100 gals.

When hydrated lime is used, about one-third more by weight than quicklime should be taken. The 4-8-100 formula then is as follows:

Copper sulphate (blue stone)	4 lbs.
Hydrated lime	11 lbs.
Water	100 gals.

Preparation According to Old Method. Dissolve 4 pounds of copper sulphate (bluestone) in an earthenware or wooden vessel. This is done by suspending the bluestone at the top of the vessel so that it is just covered with water, thus enabling the dissolved material to settle at the bottom of the container. Slake 8 pounds of lump lime in a separate vessel. Dilute each solution to 50 gallons and pour simultaneously into the spray tank.

In commercial operations it is customary to have large concentrate tanks in which 1 pound of bluestone has been dissolved in each gallon of water. In other words, a 50-gallon tank would contain 50 pounds of bluestone dissolved in 50 gallons of water. The lime is slaked so that each gallon of water contains 1 pound of lime. Both tanks are then placed side by side and the required number of pounds of each material is poured into the tank, using 1 gallon of each solution to represent 1 pound. The required amount of water is added to each tank and the solutions are then run through a common outlet into the spray tank. For a 200-gallon spray tank, 8 gallons of bluestone solution would be placed in one dilution tank and 16 gallons of the lime water in the other tank. Water should then be added until each tank contains 100 gallons, after which the contents of both tanks are emptied into the spray tank through a common opening as indicated above. For the successful use of this method, a gravity water system is necessary to fill the concentrate and the dilution tanks. The latter should be high enough to permit the solutions to flow by gravity into the spray tank.

A method in common use is to add the required amount of bluestone solution directly to the spray tank. After adding water, sufficient to fill the tank two-thirds full, the proper amount of the lime solution is added.

The formula given above results in what is known as 2-4-50 Bordeaux mixture.

Dilution. The 2-4-50 formula is used on apples, pears, and quinces unless otherwise specified. In the case of sprays for melons or special sprays for other fruits, the correct information may be secured by writing to the Extension Division at Blacksburg, Virginia, or to the Virginia Truck Experiment Station, Norfolk, Virginia.

Caution. Do not use Bordeaux mixture on peaches during the growing season. Whenever Bordeaux mixture is used in the early season for spraying apples, russetting and burning of the fruit is liable to follow. This spray should be used as a mid-summer spray. It is the most effective spray material known for the control of bitter rot of apples. Never use agricultural lime in preparing Bordeaux mixture.

Dry Mix Sulphur Lime

The dry mix sulphur lime material has largely replaced self-boiled lime and sulphur as a peach fungicide in Virginia. The advantage of this material over self-boiled lime and sulphur is that it is more uniform in strength, gives equally as good control

of diseases, and is cheaper and easier to prepare. There are two formulas given:

Formula No. 1

50 pounds of dusting sulphur.
42 pounds of hydrated lime.
8 pounds of powdered lignin pitch, known under such trade names as Goulac, Bindex powder, and Bandarene flour.

Formula No. 2

50 pounds of dusting sulphur.
46 pounds of hydrated lime.
4 pounds of calcium caseinate, known under the trade names, Kayso, Spracein, Adheso, Spreado, and Spray Spread.

The preparation of the above formulas is the same, with the exception of the difference in the amount of ingredients used. In preparing either formula, the ingredients should be thoroughly mixed and screened through a 14- to 16-mesh screen. Another important feature which should not be overlooked is the necessity of using the very best grade of hydrated lime available in making dry mix.

In the preparation of Formula No. 1, powdered lignin pitch (Goulac, Bindex, or Bandarene flour) is used as the wetting and sticking agent. In Formula No. 2, calcium caseinate (Kayso, or Spracein) is used for that purpose. There are some advantages in using Formula No. 1, since it is cheaper to prepare, stays in suspension better, and is easier to wet into a paste form than Formula No. 2. Formula No. 2, however, makes a good dry mix. The sticking qualities of any dry mix depends largely upon the quality of the ingredients used in its preparation and the thoroughness in which they are mixed. Either a dust mixer or a barrel mixer may be used to mix the ingredients. They may also be mixed in a box with a hoe, but this method is not entirely satisfactory.

Rate of Dilution. Dry mix, either formula, should be diluted at the rate of 8 pounds to 50 gallons of water, or 32 pounds to 200 gallons, when used as a peach fungicide. When dry mix is used as an apple spray, it should be used at the rate of 10 pounds to each 50 gallons of water, or 40 pounds to 200 gallons.

How to Dilute. The proper amount of the dry mix material should be placed in a water-tight barrel and sufficient water added to produce a thin paste after thorough stirring with a paddle. The paste is then poured through the strainer into the tank, which should be from one-half to two-thirds full of water, after which it is filled. The tank agitator should be running. Lead arsenate is added in the usual manner.

Cautions. Do not place dry mix at the bottom of the tank and then add water. Do not dilute dry mix unless it has been thoroughly mixed and sieved. Use a good grade of dusting sulphur only, and the best grade of hydrated lime available. When spraying peaches, use 8 pounds of dry mix to 50 gallons of water; but when spraying apples, use 10 pounds to 50 gallons of water.

When using lead arsenate with dry-mix sulphur lime, add an additional 5 pounds of hydrated lime for each pound of lead arsenate used. The lime and the lead arsenate should be mixed and added to the tank in the form of a thin paste.

Zinc-Lime Spray or Zinc Bordeaux

The zinc-lime spray, or zinc Bordeaux, is a new material introduced as a control measure for bacteriosis and for the checking of arsenic injury to peach foliage, twigs, and fruit. As a control measure for bacteriosis, 5 to 7 applications are necessary. When bacteriosis is not a problem, the zinc-lime material should be used in the lead arsenate applications only. Zinc Bordeaux has very little fungicidal value and cannot be depended upon for the control of scab and brown rot. This material, however, may be combined with the common peach fungicides, such as calcium sulphide; dry mix, either formula; and self-boiled lime and sulphur.

Formula for Zinc Bordeaux

Zinc sulphate	4 pounds
Hydrated lime	4 pounds
Water	50 gallons

Preparation of Zinc Bordeaux. Fill the spray tank about two-thirds full of water and start the agitator. Then slowly add the zinc sulphate and continue the agitation until the zinc sulphate has dissolved. Mix the hydrated lime into a thin paste with water and wash it in through the tank strainer. Continue the agitation until the zinc sulphate and lime are thoroughly mixed. This will only take a few minutes.

If a fungicide, such as calcium sulphide, dry mix, or self-boiled lime and sulphur, is to be used in combination with the zinc-lime material, it should be added last, and only after the zinc-lime material has been thoroughly agitated.

When lead arsenate is used with the zinc-lime spray, either alone or in combination with a fungicide, it should be made into a thin paste and poured into the tank through the tank strainer while the agitator is running.

These combination sprays should be used as soon as prepared.

Self-Boiled Lime and Sulphur

This fungicide has been in common use to control scab and brown rot of peaches. It is a summer spray for peaches.

Preparation. Place 8 pounds of stone lime in a vessel and slake with hot water. As soon as slaking begins, add 8 pounds of flowers of sulphur made up into a thin watery paste. Stir vigorously and add water to prevent burning. Cool immediately by adding water after slaking ceases, which may require from 5 to 25 minutes, depending upon the quality and condition of the lime.

Dilution. The product resulting from the formula given above should be diluted to 50 gallons for use. In commercial orchards, 200 gallons of the mixture are prepared at one time. To

produce this amount, it is necessary to use 32 pounds of stone lime and 32 pounds of sulphur.

Caution. Self-boiled lime and sulphur cannot be stored, therefore, it is necessary to prepare it freshly every time it is used. It should be properly diluted before adding lead arsenate in combination sprays.

Dry Lime-Sulphur

Dry lime-sulphur is a substitute for liquid lime-sulphur. It is made by removing the water from liquid lime-sulphur. The usual amounts recommended by manufacturers are about as follows:

1. For scale in the dormant or delayed dormant period of the tree, use 12 to 15 lbs. of dry lime-sulphur in 50 gallons of water, or 9 to 11 tablespoonfuls in one gallon of water.
2. For summer sprays, use 3 to 4 pounds of dry lime-sulphur in 50 gallons of water, or 2½ to 3 tablespoonfuls in one gallon of water.

Note: Dry lime-sulphur may be used on all plants and trees that can be sprayed with liquid lime-sulphur. It should not be used on peach trees after the dormant period of the tree. For best results in controlling scale, dry lime-sulphur should be used at strength comparable to that of liquid lime-sulphur, in which case it takes approximately 4 pounds of dry lime-sulphur to equal one gallon of liquid lime-sulphur. Our spraying recommendations for the dormant period call for 12 gallons of liquid lime-sulphur 32° Baume to make 100 gallons of spray. To get comparable strength with the dry lime-sulphur we should use 48 pounds of the dry lime-sulphur to make 100 gallons of spray.

The same basis should be used for the summer sprays, that is, our recommendation for summer sprays on apples is 2½ gallons of liquid lime-sulphur to make 100 gallons of spray and on that basis it would require 10 pounds of dry lime-sulphur to make 100 gallons of spray.

Caution: Dry lime-sulphur is entirely different from dry mix sulphur lime. Buy dry lime-sulphur from reliable manufacturers only.

Calcium Sulphide

Calcium sulphide has been found to be an effective fungicide for summer sprays for both apples and peaches; and can be substituted for lime-sulphur and dry-mix sulphur lime. It should not be used, however, to replace Bordeaux mixture in the late summer applications on varieties of apples susceptible to bitter rot.

Calcium sulphide is a finely powdered material and should be used at the rate of 6¼ pounds to 50 gallons of water on both apples and peaches. This material is very easily handled in that it mixes readily with water in the spray tank. It may be added to the tank either before or after the tank is filled with water, or it may be washed into the tank by the inflowing water. The material should be slightly agitated in the spray tank before ap-

plying. If lead arsenate is used with calcium sulphide it may be added to the tank in the usual manner.

Lead Arsenate

Lead arsenate is the most commonly used internal insecticide. It kills such chewing insects as codling moth, curculio, and leaf roller. It is used either in the powder or paste form. The powdered form is in most general use and is recommended.

Dilution (very important). Lead arsenate is prepared for spraying by adding 1½ pounds of the powder or 3 pounds of the paste to 50 gallons of the spray material, such as lime-sulphur or Bordeaux.

When combining lead arsenate and lime-sulphur add the materials to the spray tank in the following order:

1. Pour in the required amount of lime sulphur.
2. To reduce arsenical injury it is advisable to add 6 pounds of hydrated lime for each 100 gallons of spray.
3. Add the required amount of lead arsenate. Do not add the lead arsenate until the tank is full of water and you are ready to drive out to spray.

It is advisable to make a thin paste of the lime and also of the lead arsenate by adding a sufficient amount of water to each of these materials in a bucket. Stir well and then pour into the spray tank. Never pour anything into the spray tank without running it through the screen.

Freshly slaked lime can be used in place of the hydrated lime and in the same quantity.

Caution. When spraying peaches with lead arsenate and water, the amounts of lime recommended on p. 14 must always be added to prevent burning. Furthermore, lead arsenate is a deadly poison and must be kept away from children and farm animals.

Nicotine Sprays

Nicotine in the form of nicotine sulphate is the most effective contact insecticide known for such sucking insects as aphids and red bugs. It is not advisable to prepare home-made nicotine preparations for a commercial orchard.

Dilution. Add 1 pint of nicotine sulphate to every 100 gallons of spray material.

Caution. Rosy aphids appear in largest numbers at the time of the green tip stage of the buds. In order to kill these insects it is necessary to cover them with the nicotine solution. It is apparent from this fact that thorough spraying is necessary to control aphids. Young apple trees and other plants infested with aphids should also be sprayed. Nicotine sulphate is a deadly poison and must not be left where livestock can get at it.

The addition of nicotine sulphate in the delayed dormant spray is largely governed by local conditions. If aphids are not present at the time set for this spray, nicotine should be omitted. This condition must be determined by observations of the grower in his own orchard.

OIL SPRAYS

Oil sprays are used for scale and red mite control and not for the control of the rosy aphis.

Lubricating Oil Emulsions

Lubricating or engine oil emulsions are made in a number of different ways. Two methods are given.

Cold Mix Oil Emulsion

Materials needed: 1. Lubricating oil, commonly known as engine oil. The following brands have been used successfully: Nabob, Diamond Paraffin, Junior Red Engine Oil, Atlantic Red Engine Oil, and Lybra.

2. Emulsifier. One of the following: Lignin pitch, or calcium caseínate.

3. Water.

Lignin pitch (waste sulphite material) occurs as a brown powder, and also as a dark syrup-like liquid. The essential constituents of the two forms of lignin pitch are the same. This material is sold under the following trade names: Goulac (powder), Glutrin (liquid), Bindex powder, Bindex liquid, Bandarene flour, and Bandarene liquid. This material may be obtained through your spray dealer. The lignin pitch material in either form is the best and cheapest emulsifier available at present for making the cold mix oil emulsions.

Calcium caseinate is sold under the following trade names: Kayso, Spracein, Adheso, Spreado, and Spray Spread.

Mix the materials in the following proportions:

Formula A

Engine oil	2 gallons	50 gallons	54 gallons
Water	1 gallon	25 gallons	27 gallons
Powdered lignin pitch or calcium caseinate	4 ounces	6 pounds	6 1/4 pounds

Formula B

Engine oil	2 gallons	50 gallons	57 gallons
Water	1 gallon	25 gallons	27 gallons
Liquid lignin pitch	6 fl. oz. (3/8 pt)	1 1/8 gallons	1 1/4 gallons

Steps in Making the Stock Emulsion

1. Run the required amount of water into the spray tank or other container in which the emulsion is to be mixed.

2. When lignin pitch is used, add it directly to the water in the tank, since it goes into solution very readily. When calcium caseinate is used, it must be worked up in water to a smooth paste in a bucket or tub. Add the paste to the water in the spray tank.

3. Start agitation and mix the emulsifier thoroughly with the water in the tank.

4. Start the pump and begin adding the oil gradually, pumping the mixture back on itself in the tank. The oil should be slowly added with continued pumping until all of it is added. Continue pumping the mixture back on itself in the tank, maintaining from 200 to 300 pounds pressure, until the mixture has passed through the nozzles at least twice. When the stock emulsion is completed, it will appear creamy and there will be no oil scum on its surface. Pump or run the stock emulsion into barrels or tubs for storing. The stock emulsion should be thoroughly stirred each time before any is taken out for dilution into spray strengths.

Amount of stock emulsion to use: Use 4½ gallons of the stock emulsion in making 100 gallons of spray solution. This makes a 3 per cent oil spray. It is advisable to add the stock emulsion to the spray tank while the tank is being filled, rather than to wait until the tank is almost full.

Cautions in making stock emulsions: 1. Follow the order of adding the materials as outlined above. Never reverse the order by adding oil, then the emulsifier, and lastly the water.

2. Never add the emulsifier to the oil but always to the water.

3. Never use lumpy calcium caseinate. Calcium caseinate carried over winter usually does not make a good emulsion. Always use fresh calcium caseinate.

4. If a stock emulsion has been kept long enough for the oil to begin separating, it should be re-emulsified. This is done by pumping the material back on itself in the tank as was done in making the original emulsion.

SOAP WASHES

Soap washes are effective for killing aphids and soft-bodied larvae of other insects. Fish oil, or fish oil soap, is generally used when large quantities are required. The commonly used formula is 1 pound of soap to 6 or 7 gallons of water.

Caution. Soap washes should not be used in combination with Bordeaux mixture and lime-sulphur preparations.

RODENT CONTROL

To the fruit grower who has cared for his orchards and grown them to the age of profitable bearing, it is most discouraging to see his trees die and go out because of injury from mice. Yet thousands of valuable trees, both young and mature, are killed in this way in Virginia orchards every year. The loss amounts to hundreds of thousands of dollars annually. In numbers the mice are increasing rapidly from year to year. Injury in the orchards is mounting each year. To cut down this injury and loss as much as possible, growers should adopt a regular program of mouse control in their orchards.

Injury from Mice

The two groups of mice which are responsible for most of the injury to fruit trees are the so-called meadow or field mice and the pine or short tail mice.

Meadow mice construct tunnels above ground in the grass and wild growth, and by their feeding habit injure the trees above the ground. The injury consists of removal of the bark from a point just below the surface to a height of several inches above the ground.

Pine mice are burrowing animals constructing underground tunnels or using runways made by ground moles. They live and feed largely under ground. Pine mice feed to some extent outside their burrows, reaching the surface through the openings in the roof of the tunnels which permits the use of poison as a control measure. Generally speaking, the injury from pine mice is below the surface of the ground and consists of eating the roots or gnawing the bark from the roots and lower parts of the crown. The true extent of the injury can only be found by removing the soil from about the tree and exposing the trunk and roots below the surface.

Control Measures

Control measures that destroy one group of mice can also be used against the other.

Cultivation and the destruction of grass and wild growth and other trash about the base of the tree, along fences, and other places of shelter afford some control.

Running hogs in the orchard also aids greatly in keeping down these pests. While cultivation and running hogs in the orchard are very important in reducing the damage done by mice, no insurance against mouse damage is so reliable as complete extermination of the mice. The use of poison bait has proved very effective for this purpose.

Poison Baits

Poison baits are prepared according to several formulas, two of these are given here.

Sweet Potato Formula:

Cut three (3) quarts of sweet potatoes into half inch cubes and place in a metal pan. Mix one-eighth (1/8) ounce of powdered strychnine sulphate (alkaloid) and one-eighth (1/8) ounce of baking soda together, and with a pepper box sift this slowly over the freshly cut sweet potatoes, stirring the potatoes constantly so that the poison will be distributed evenly over the bait. This bait should be used while fresh. The poison should be distributed systematically between rows as well as under the trees, especially under and close to the tree trunks, dropping the bait frequently into the mouse tunnels through the natural openings or through holes made with a sharpened stick.

Starch Coated Grain Bait:

1 tablespoonful gloss starch	¼ pt. heavy corn syrup
1 oz. powdered strychnine	1 tablespoonful glycerine
1 oz. baking soda	12 qts. wheat or 20 qts. steam crushed whole oats

Mix the 1 tablespoonful of gloss starch in ½ teacupful of cold water, stir into ½ pint of boiling water to make it a thin clear paste. Mix 1 ounce of powdered strychnine with 1 ounce of powdered bicarbonate of soda and stir the mixture into the hot starch to a smooth creamy mass free from lumps. Stir in ¼ pint of heavy corn syrup and 1 tablespoonful of glycerine. Apply to 12 quarts of wheat or to 20 quarts of steam crushed whole oats and mix thoroughly to coat each kernel. Allow the bait to stand over night before using in order that the grain may absorb the poison.

Teaspoonful quantities of the poisoned bait should be placed in poison stations, well distributed over the infested area. The poisoned bait may also be placed within the entrance of the burrows or through openings into the tunnels made with a stick, a teaspoonful in a place.

Caution. All poison containers and all utensils used in the preparation of poisons should be kept plainly labeled and out of reach of children, irresponsible persons and livestock.

Poison Stations

Poison stations are used to make poison bait readily accessible to mice without exposing it to the weather. A wooden poison station which has given good results may be constructed as direct-

Fig. 1. Types of poison stations used in distributing poison bait in mice infested orchards

ed below (Fig. 1, D). Square pieces of 1 by 8 inch boards are cut for the tops and 1 by 6 inch boards for the bottoms, two side walls are cut from 1 by 1½ inch strips into 6 inch lengths. The whole is fastened together with four nails. Another type of home made station may be constructed from pieces of wood and old pieces of tin as shown in figure 1, G, H.

Drain tiles of 1½ inch diameter or larger serve fairly well as poison stations (Fig. 1, E). Tile stations absorb moisture rather freely in damp places which results in moldy baits. Fig. 1, A, shows a poison container made of glass which is used by the fruit growers in different fruit sections. This container allows the mice free access yet prevents rain from getting in and the bait from spilling out.

Wide-mouth bottles (Fig. 1, B) and glass jars may be used, as may tin cans, though the latter are less effective than wooden, glass or tile containers.

When Poison Bait Should Be Put Out

The first application of poison bait should be put out in late fall, a second one during the winter, and a third one in the spring. If poison stations are used the stations should be examined from time to time and refilled as required. The poison stations should be on high ground to avoid standing water and so placed that there will be a circulation of air to aid in keeping the bait dry and in good condition. Under conditions of a moderate infestation, one station to a tree should be sufficient. It should be placed close to the base of the tree to escape orchard machinery, and should be covered lightly with vegetation, prunings, or other material that will afford shelter for the mice. When the infestation is heavy, the number of stations may be increased.

In addition to the stations, poison bait may also be placed in the entrances of the burrows and inside of the mouse tunnels. In Fig. 3 is shown a device for placing bait in runways and tunnels from a standing position. The McCue poison bait gun, for which the patent is pending, is the invention of Mr. Purcell McCue, Greenwood, Virginia, and is so constructed that only a definite amount of poison bait, a teaspoonful, is dropped into the tunnel or entrance of the burrow at one time. The bait gun not only saves time in distributing poison bait but makes the task much easier.

The gun will be patented by Mr. McCue for the protection of the grower. It is not manufactured in quantity by any one at this time, but it is entirely legitimate for the grower to have the gun made by a local tinsmith for his own use, so long as he does not offer it for sale. Dimensions can be taken from drawing given below (Fig. 2).

Note. Through a cooperative project between the United States Department of Agriculture and the Horticultural Department at Blacksburg, Virginia, growers may purchase steam crushed whole oat poison bait at cost. The cost of this bait is 6½ cents a pound f. o. b. the Federal Mixing Plant at McGammon,

Idaho. The minimum amount which will be sent to any one shipping point is 100 pounds. The purchase price of the bait must be sent with the order. Checks should be made out to the Poison Bait Fund.

Protection Against Rabbits

In young orchards where there is danger that trees may be damaged by rabbits, protection best takes the form of some material wrapped about the base of the trees. Tar paper is effective but should be removed each spring as injury to the bark will result if allowed to remain.

Newspapers and building paper are effective.

The most satisfactory material is hardware cloth with from two to four meshes per inch. It can be purchased in rolls 36 inches wide. The roll may be cut in two at the center, making each strip 18 inches wide. These strips are cut into pieces at 14-inch intervals so that pieces 14 x 18 inches are obtained. Roll and bend the strip about the trunk of the tree in such a manner that the long way is up and down the trunk, and that the edges overlap well. Push the lower edges well down into the soil; twist a small wire loosely about the center.

Repellent washes may also be used to good advantage. A wash of ordinary whitewash applied with a brush to the tree trunks has given good results in some cases. Rubbing the trunk with a piece of fresh liver has also given good results. A repellent wash recommended by the United States Department of Agriculture is:

Fish oil	⅛
Concentrated lime-sulphur	⅛
Water	⅛

Mix the materials thoroughly and paint the tree from the ground well up into the scaffold limbs.

Sulphonated Oil

"Sulphonated oil," made by adding sulphur to heated linseed oil, has been found to be an excellent repellent for rabbits by R. B. Harvey of St. Paul, Minnesota.

Sulphonated Oil. Heat raw linseed oil until it is smoking hot (about 270° C.). Remove from fire and add sulphur **slowly** and **carefully** until 10%, by weight, of sulphur has been added.

Dilute with water or turpentine and spray on trees with oil sprayer.

Caution. Remove the heated oil from the fire before adding the sulphur. Be sure to stir in the sulphur very slowly.

Fig. 2. McCue poison bait gun
Note that when lever is raised, magazine is closed and nozzle opened, allowing bait to fall. When lever is pushed down, nozzle is closed and magazine opened, allowing nozzle to fill with bait.

BRIDGE-GRAFTING

There are few fruit growers who have not suffered loss because of the girdling of their trees by mice and other rodents. Girdled trees may be saved by bridge-grafting. A bridge graft is made by using scions to connect the two portions of the bark of a stock which have been separated by an injury. The best time to do bridge-grafting is in the spring after the bark begins to slip; about the time the buds are swelling.

Equipment

Equipment needed for bridge-grafting is a sharp knife, a hammer, small wire nails (cigar box nails), grafting wax, spade, pruning shears, and large well matured scions.

Scions

Scions the thickness of a common lead pencil are preferred. They should be taken from the previous season's growth. Water sprouts make good scion wood if the buds are well developed and the wood is well matured. Scions may be cut any time while they are dormant and buried in moist sand, sawdust, or soil, until needed. If placed on top of the ice in an icehouse and properly covered, they will keep well. It is very essential that the scions be kept dormant until they are set.

Scions should be long enough to bridge the girdled or wounded area and overlap three to four inches on sound tissue above and below the wounded area.

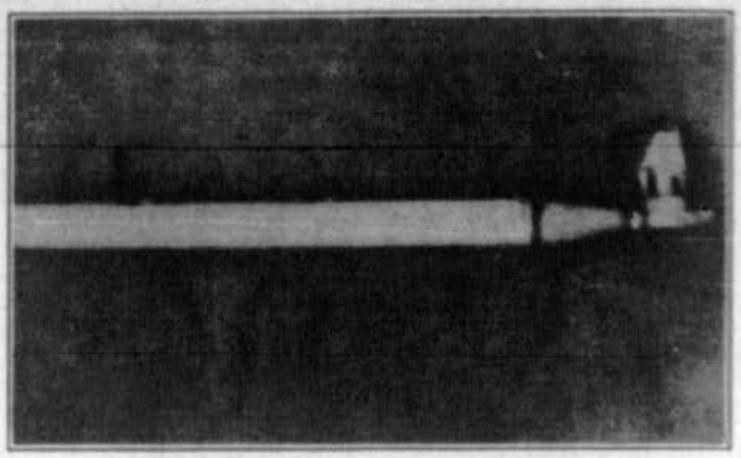


Fig. 3. The McCue poison bait gun for shooting poisoned grain into underground tunnels

Types of Bridge-Grafting Used

Common Bridge-Grafting Method:

The simplest and, where it is feasible, the most easily made union, involves an L-shaped cut in the bark. Below the wound the L is inverted. Each arm of the L is about one and one-half inches in length and each is cut an inch or two from the edge of the wound. The scion is beveled at either end, principally on the side destined to be set against the tree; the other end is beveled sufficiently to give a rather sharp angle to the wedge. The bank in the angle of the L cut is raised sufficiently to admit the scion, which is then inserted and the small wire nails driven through the bark and the scion. Nailing is necessary because it is very difficult to bend the bark back sufficiently to set the nail directly into the scion without injury to the bark and because of this there is a tendency for the bark to shrink wherever it is cut vertically and its great tension relieved. This union is best suited to trees with thin or only moderately thick bark. Scions should be set right end up, that is, as they grew on the tree. One scion for each two inches in the circumference of the tree will be sufficient. After the scions are in place the area about the ends of the scions should be carefully waxed to prevent drying out, and to exclude air and moisture.

Inlay Method of Bridge-Grafting:

For trees with thick bark, or for cases where scions are set into the roots, the inlay graft is preferable. In operation, the scion is cut at ends to a long, flat, shallow bevel, two to four inches on the inner side, and ends are cut square instead of to a wedge shape. About one-third to one-half of the wood is removed in

making the bevel. The scion is laid across the area to be bridged, making any necessary allowance for bending scion, and the outline is lifted out and the scion inserted and fastened in place with small cigar box nails, using care to have the cambium of the scion in firm contact with the cambium of the stock at one side at least and preferably on both sides and end. When the scions are placed and fastened after this fashion, the ends of the scions and wound are covered with wax. When brush wax is used, it is best to insure prevention of injury to the cambium from the hot wax by placing a small amount of hand wax about the union of stock and scion, which will not injure growth and which prevents the hot wax from flowing into direct contact with fresh cuts. To prevent splitting of the scion, holes may be made in the scion by the use of a small automatic drill or gimlet.

Approach Grafting:

Where trees have had their roots so badly injured that scions can not be readily attached to them, small seedling or nursery trees three to six feet in height are planted at the base of such trees and the tops grafted into the tissues above the wound according to one of the above mentioned methods.

Grafting Waxes

Both hand wax and brush wax are used in bridge grafting. Hand wax is applied with the hands and brush wax with a brush while hot. Brush wax is easier to apply and is most satisfactory.

Formula for hand wax:

Resin	4 lbs.
Beeswax	2 lbs.
Tallow	1 lb.

The resin is melted first, then the beeswax is put in, and, when this has melted, the tallow is added. As soon as the tallow lumps have disappeared, the mixture is poured into cold water. When cool enough to handle, pull with the hands until the wax is a pale amber color. The pulling gives the wax texture and toughness. This wax is applied when pliable with the hands. In cold weather the wax requires considerable working unless it is kept in warm water. The hands must be greased in order to keep the wax from sticking.

Formula for brush wax:

Resin	5 lbs.
Beeswax	1 lb.
Powdered charcoal	½ lb.
Raw linseed oil	¼ lb.

The resin is melted, the beeswax added and melted, the linseed oil added, the mixture removed from the fire and the charcoal stirred in a little at a time to avoid boiling over. As soon as the cooking is completed, the wax may be cooled somewhat and used at once. The wax is applied with a brush while hot.

The use of brush wax necessitates the use of equipment to melt the wax for field use. Such equipment may be purchased, but a very convenient outfit may be made at home from a 5 gallon oil can. The top of the can is cut out and a pan is used in its place that will nest in, but will not drop through. This pan is used as a container for the wax. One side of the can is cut horizontally across at the bottom and up the sides from the horizontal

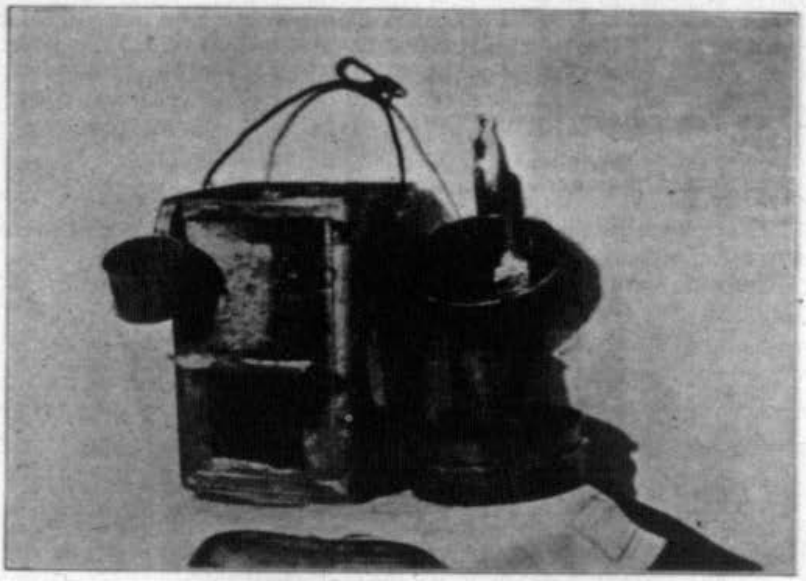


Fig. 4. Home-made apparatus for melting brush wax. Small pan on left was used as a container for hand wax

cut to midway up the sides. This flap is then pulled up to admit the entrance of a flat oil lamp, which is used to heat the wax. The flap may be pulled down partially to protect the flame from the wind. The flame can be raised or lowered to regulate the heat. (See Fig. 4.)

Wound Dressings

A wound dressing should possess the following properties: It must check the weathering of the wound; must prevent growth of bacteria and fungi; should also be of such a nature as not to injure the cambium and bark. The ideal dressing is a protective compound and an antiseptic. It does not hasten the healing process except as it prevents decay.

Most coverings for pruning wounds tend to injure the cambium and delay callus formation around the wound. Bordeaux mixture paste and white lead make good dressings for pruning wounds on apple trees. Bordeaux mixture paste does not stick for any great length of time. White lead thinned with linseed

oil to a thick paste makes a good all-around dressing for common pruning wounds. It does not cause injury.

A common wound dressing used in Frederick County is prepared as follows:

Coal tar (gas tar)	2 parts
Creosote (shingle dip)	1 part

Stir creosote into the coal tar until the mixture is thin enough to paint. Avoid painting anything but the cut surface of the wood. Painting this dressing on the bark causes the bark to die back and thus prevents the wound from healing properly.

Paraffin Asphaltum Dressing:

Asphaltum	8 parts (by weight)
Parafin	2 parts (by weight)

This preparation has no harmful effects on the tissues and is a very durable covering.

Common grafting wax may also be used as a wound dressing without injury to the tissues.

STAUNTON FIELD LABORATORY
Report of Observations
Week Ending 5/16/31

Weather

Date		Precipitation	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.
May	9		76	48	90	47
	10		75	56	98	58
	11	.81 in.	60	46	100	67
	12	.36	66	48	100	68
	13	.30	68	47	98	67
	14	.08	67	48	98	55
	15		77	46	78	54

For the greater part of the week the weather has been cool and wet. Spraying has been greatly hindered, especially the first of the week. Scab infection is showing up to some extent as a result of the wet weather.

The petal-fall spray started in this county on Monday. Many growers have almost completed it, but on account of the unfavorable weather, there is still much spraying to be done. There should be five or six days in most places before the calyx lobes close. If the weather is favorable first of next week, the spray will be completed.

At Crozet the curculio is still entering the orchards. It was found in a second orchard in that vicinity on the 12th. Continued jarring in the Zirkle orchard indicates that they are still entering . On May 14 one curculio was jarred from ten trees in an orchard at Timberville. No sign of feeding or oviposition started in the insectary here on May 9 or 10. The insects continue to lay a few eggs, but very few. Warmer weather should stimulate them.

The codling moth has not started emerging in the laboratory. They started emerging in a packing shed at Waynesboro on May 8, and are coming out in increasing numbers.

The caterpillars so common in the orchards and on all trees around Staunton and in the Piedmont are the forest tree tent caterpillar, and not the apple tent caterpillar. They seem to be doing little damage, but many people are complaining of them as a nuisance on porches and about houses in general.

E. H. Cox, county agent of Rockingham County, reports army worms doing considerable damage to hay fields in the eastern part of that county.

Codling moth had emerged at Greenwood on Tuesday.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS
State of Virginia, Va. A & M College & Poly. Inst. & U.S.D.A. Cooperating
EXTENSION SERVICE

V.P.I. Spray Service

Virginia growers as a whole were disappointed with the way their 1930 apple crop graded out. In other words, the Virginia crop of 1930 was not up to standard.

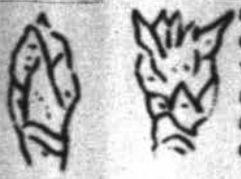
Weather conditions favored codling moth and aphis development. These insects put on a great demonstration. The result was a large cull pile, It is impossible to go back to the beginning of the spray season at harvesting time. The damage done cannot be corrected, the grower must take the loss.

The 1930 season was not favorable to scab development. This does not mean that scab will not be serious in 1931. On the contrary, the coming season may be an epidemic year. Growers should be alert to the situation. Control depends upon prevention of the primary infection.

Mr. Fruit Grower, plan to do the spraying job this coming season in such a manner that there will be rejoicing among growers and consumers alike instead of regrets.

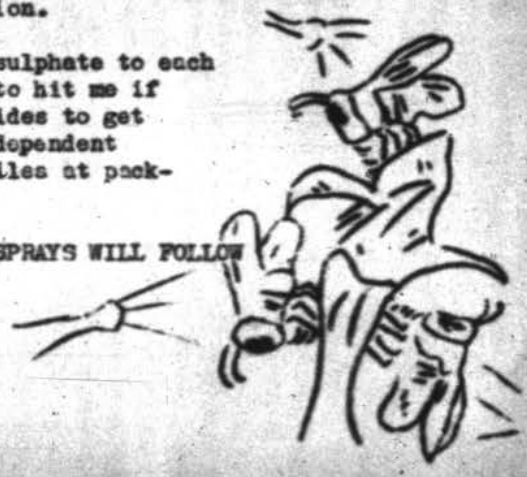
This is station S-C-A-B, THE GREAT PROFIT TAKER INSURE YOUR CROP AGAINST ME--SPRAY ON TIME AND SPRAY THOROUGHLY.

Remember apple consumption and the widening of our markets is largely dependent upon the kind of fruit you offer the consuming public. The trade wants fruit free from dirts, of high quality, of good color, and free from blemishes. Each of the six sprays in the apple spray program has a specific duty to perform. Do not take a chance by omitting any of them.



The duty of the delayed dormant spray is to control scale and aphis. The time for applying this spray is governed by the stage of bud development. Begin the application when green shows in the blossom buds. Complete by the time the leaves on the blossom cluster are 1/4 to 1/2 inch long. Use 12 gallons of lime-sulphur, (32° Baume test) to make 100 gallons of spray solution, or a 3% solution of oil emulsion.

For aphis control, add one pint of nicotine sulphate to each 100 gallons of spray solution. You have got to hit me if you are to get me. You must spray from all sides to get good control of aphis. Remember profits are dependent upon what the harvest brings. Let us have smiles at packing time.



NOTICES FOR OTHER SPRAYS WILL FOLLOW

#11,715

THE TAR OIL WASHES

The purpose of this letter is to inform growers that the tar oil washes are relatively new and that they have been tried only on a limited scale in this country. These preparations have been tested in England for several years. The conditions there are somewhat different, the climate is generally moist and the applications for the most part have been made with a hand sprayer. Experiments in this state to determine under what conditions the tar spray can be used without injury to the wood or to the buds have been in progress only one season and have included only a few trees. At the present time the wood in many orchards is in a very dry condition owing to the drought of the past twelve months and probably would be more susceptible to injury by oil sprays than in previous years.

Tests in several states indicate that the tar oil washes will kill the eggs of the rosy aphis but at present, there are no tests available which show that this tar oil wash will be more effective for this purpose than lime-sulphur and nicotine. At present prices and dilutions recommended the tar wash is slightly more expensive than the lime-sulphur and nicotine. Regarding the use of the tar oil was for the control of scale, Dr. Hough writes on February 4 as follows:

"Last November I applied Barko in the proportions of 1-10, 1-15 and 1-20 in two orchards infested with San Jose scale. This material is the American version of the McDougall's tar wash (English) which I used in the Spring of 1930. A preliminary examination of the twigs shows that some of the scales have been killed but unless the ultimate kill approaches 100%, I cannot see how it can be used advisedly for this insect."

It seems quite clear that the tar oil wash is very effective in controlling the pistol case bearer in the dormant stage.

It is recommended that persons who are planning to try the tar oil wash this spring should spray only while the trees are dormant and the tests should be confined to a few trees only. The fact that its usefulness as a control for the San Jose scale is yet to be determined and that our knowledge regarding the danger of injury to the wood and buds, especially in their present dry condition is somewhat limited.

This material has possibilities as a spray for aphis eggs and for the pistol case bearer, but our information as to its value as a dormant spray remains to be determined.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. DEPARTMENT OF AGRICULTURE AND STATE LAND-GRANT COLLEGES COOPERATING

Apple spray #2. The pink spray on apples (See Extension Bulletin 123) this spray should be applied when the majority of cluster buds have separated. As this is a condition or stage of development, no specific dates can be given. Variations in development within the same variety or between different varieties govern the exact time for proper spraying. Every grower must decide for himself the proper time to apply the spray to get best results.
Use lime-sulphur 10 qts. standard strength, and water to make 100 gallons. If curculio is present add 3 lbs. lead arsenate. Indications are that scab will be with us this year. This is an important scab spray and cannot be omitted.

Director.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. DEPARTMENT OF AGRICULTURE AND STATE LAND-GRANT COLLEGES COOPERATING

Apple Spray #4. Three Weeks Spray. See Spray Calendar for 1931 for CODLING MOTH, Curculio, SCAB, Mildew, Leaf Spot, Blotch. Time of Applications: Begin spraying , or about 20 days after commencing petal fall spray.

Materials to use: Lime-sulphur (32° Baume) 10 qts. to make 100 gals. of solution. Add 3 lbs. powdered lead arsenate. Mix lead with 6 lbs. slaked rock-lime or 9 lbs. hydrated spray lime before adding to the tank. See spray bulletin, page 23.

Remarks: THIS IS AN IMPORTANT COVER SPRAY AND SHOULD BE APPLIED TO ALL VARIETIES. If temperature at time of application is 85° or above, Bordeaux mixture 4-8-100 can be substituted. Conditions have been favorable for scab development. It is most important that this spray be applied in a thorough manner.

Director.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. DEPARTMENT OF AGRICULTURE AND STATE LAND-GRANT COLLEGES COOPERATING

June 30, 1931.

At least one spray should be applied for the control of the second brood side-worms on apples. The date has not been determined but the most effective time for this spray this season will be during the latter half of July. Since brushing or wiping machines may not be adequate to remove the residue resulting from a late spray, a late application will be advised only where the grower is prepared to wash the fruit at picking time. The purpose of this card is to notify growers who are not equipped to wash the fruit that they should begin at once applying spray #6 in the spray calendar. Growers who are prepared to wash spray residue from their fruit should wait until regular notice is sent out as to the date for applying spray #6. Codling moth infestation is very heavy in all sections. If we are to harvest a clean crop of apples we must keep poison where the worm can get it at all times.

Jno R Hutcheson

Director

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. DEPARTMENT OF AGRICULTURE AND STATE LAND-GRANT COLLEGES COOPERATING

V.P.I. Spray Information

Spray #5. Five Weeks Apple Spray. See spray calendar #123. For codling moth and other chewing insects, bitter rot and blotch.

Time of Application: Begin spraying _____ or about 5 weeks after beginning the petal fall spray.

Material to Use: Bordeaux mixture 4-8-100, add 3 lbs. of powdered lead arsenate to each 100 gallons.

Remarks: This spray should be applied in every orchard. It is very important for codling moth, bitter rot and blotch. Pippins and other susceptible varieties should be sprayed.

Jno R Hutcheson

Director.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. DEPARTMENT OF AGRICULTURE AND STATE LAND-GRANT COLLEGES COOPERATING

Spray #6 Midsummer spray, to control codling moth and other chewing insects, blotch and bitter rot. BEGIN SPRAYING July _____
Materials to use: Bordeaux 4-8-100, add 3 lbs. lead arsenate to each 100 gals.
NOTE: GROWERS APPLYING THIS SPRAY SHOULD BE PREPARED TO REMOVE SPRAY RESIDUE TO MEET THE WORLD TOLERANCE.

REMARKS: Virginia's apple crop will be considerably larger this year. This is true of mid-west and eastern sections. The consumer's buying power is less. A high percentage of quality fruit should be the watchword of Virginia growers. We are going to advertise Virginia apples. Your packaged fruit must be GOOD to bring repeat orders. - It is not too late to thin apples.

Jno R Hutcheson
Director.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. DEPARTMENT OF AGRICULTURE AND STATE LAND-GRANT COLLEGES COOPERATING

Apple Spray #5. Petal Fall Spray (see apple spray calendar) The duty of this spray is to control codling moth, APPLE SCAB, leaf spot, mildew, leaf roller, and other chewing insects. Begin spraying when most of the petals have fallen and complete before the calyx lobes or cups close.

Use lime-sulphur 32° Baume, 10 qts., and water to make 100 gals of solution, add 3 lbs. of arsenate of lead, mix the lead with 9 lbs. of hydrated lime or 6 lbs. of rock lime before adding it to the spray. Mix the lead and lime in the form of a thin paste.

To control codling moth it is essential to kill the worms of the first brood. Use sufficient material to cover all parts of the tree thoroughly. Be sure to cover the under side of the leaves from the bottom-most branches to the tips of the top-most branches. You cannot get good results with careless hit and miss methods.

County Agent

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. DEPARTMENT OF AGRICULTURE AND STATE LAND-GRANT COLLEGES COOPERATING

To The Peach Growers of Virginia:

The adults of the plum curculio are beginning to come out from their winter quarters. Adult curculios have been found in some of the peach orchards in the Roanoke and Crozet sections. They are expected in other sections soon if the temperature of the past few days continues. They will continue to come out for several days, depending on the temperature.

Growers should spray as soon as most of the petals have fallen. Use 2 lbs. of lead arsenate in each 100 gals. of water, and 8 lbs. of freshly slaked lime, or 10. lbs. of hydrated lime in each 100 gals. of water.

This is spray #2 in the peach calendar.

Jno. R. Hutcheson

Director

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. DEPARTMENT OF AGRICULTURE AND STATE LAND-GRANT COLLEGES COOPERATING

Spray #2 for Peaches

Owing to the very uneven development of peaches in the different sections, and in the different orchards in these sections, it is almost impossible to set a date for applying the shuck fall spray.

The grower will, therefore, have to determine the proper time from the stage of development in his orchard. In some localities the trees have shed the shucks and are ready for the spray. In others the shucks have not begun to break. As soon as they do begin to drop, start spraying.

Use 2 lbs. of powdered lead arsenate to 100 gals. of water, add 8 lbs. of freshly slaked lime, or 10 lbs. of hydrated lime, to each 100 gals. of solution. Apply the spray in a thorough manner. Spray the inside of the tree as well as the outside.

Jno. R. Hutcheson

Director.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. DEPARTMENT OF AGRICULTURE AND STATE LAND-GRANT COLLEGES COOPERATING

Notice #3 for spraying peaches to correspond to spray #4 in the spray calendar to control CURCULIO, SCAB, and BROWN ROT.

REMARKS: Curculio are still being found in peach orchards. This spray should be put on 3 weeks or thereabouts after the shuck fall spray. In some peach sections where the arsenate of lead and lime sprays have been used, trees are dropping a considerable number of their leaves. To reduce arsenical injury and bacteriosis the following materials should be used.

MATERIALS: A combination spray consisting of Zinc Bordeaux (see page 21 of spray calendar 123) to which add one of the following fungicides, calcium sulphide, dry mix or self-boiled lime-sulphur (for amounts see spray #4 page 14 in spray calendar) and arsenate of lead 1 lb. in each 50 gals. of solution. Additional lime is not necessary with the Zinc Bordeaux. Directions for preparing and mixing, see page 21 of spray calendar.

Jno. R. Watkeson

infestation of these pests in a number of sections. Much improvement was, therefore, noted this year. In general, growers are doing a better job of spraying than they have ever done before. The outlook is for more progress in the future.

Spraying Demonstrations. Good spraying is essential in the production of good fruit. There are still growers who are not using enough material and are careless as to the way the materials are put on. It is a very easy matter for such growers to question the recommendations of the spray service. However, in order to check up on the spray service and also to demonstrate that good results can be secured with the spray program and the materials that are recommended, a number of demonstration plots were selected in orchards in which growers had failed to control either diseases or insects and in communities where the program was not followed through the season.

In planning and laying out these demonstrations, the plots are located in the part of the orchard in which it has been most difficult to get control. In other words, that part of the orchard in which the infestation is the greatest. Arrangements were made with the grower through the county agent. The grower furnishes materials and equipment. The specialist does the actual spraying in the whole plot. In each instance the materials were used as recommended by the spray notice sent and applied on the date recommended for the district in which the orchard is located.

Demonstration Plots were located in orchards as follows:

(1) Demonstration to control aphis and scale, Wythe county
(2) Demonstration to control aphis, Roanoke county
(3) Demonstration to control scale, Franklin county
(4) Demonstration to control aphis, scab, and worms, Page county
(5) Demonstration to control scale, scab, and worms, Rappahannock county
(6) Demonstration to control scab and worms, Nelson county

Description of Demonstration Orchards. The demonstration plot in Wythe county was in Mr. H. L. Bonham's orchard. The trees in this orchard were heavily infested with aphis in 1930, especially the trees of the King David variety which is more susceptible to aphis trouble. Mr. Bonham has difficulty in getting control. Fifteen King David trees were selected and sprayed with Tar Oil Winter Wash, a new materials which has given good results in experimental tests. The spray was applied while the trees were dormant.

Results. There were no colonies on the treated trees. However, as there was only a slight infestation on other trees in the orchard the effectiveness of the material could not be determined.

The demonstration plot in Roanoke county is the orchard owned by Mr. E. D. Mininger. The trees were sprayed with Tar Oil winter wash in the dormant stage, but due to the fact that there was little aphis infestation in this orchard, the results were considered negative.

The demonstration plot in Franklin county was in a young apple orchard owned by Dr. S. S. Conrrant. It has been difficult to get control of San Jose scale in this orchard. A three per cent home made oil emulsion was used in the delayed dormant stage. A new Friend machine tractor pulled with power take-off was used.

Results

100% scale control
Worms - none
Scab - none

The demonstration plot in Page county was located in the orchard of the Shenandoah Park Orchard Co. The plot consisted of forty-four trees of the Blacktwig variety. Most of these trees were located in a depression in the orchard where conditions would be ideal for scab development. In previous seasons the owners have not been able to get control of scab in this orchard. The full number of sprays were applied. Nicotine sulphate applied in the delayed dormant spray failed to give complete control of aphis.

Paste in narrative form

Results

Scab - none
Worms - none
Scale - trace
Aphis - 5%

How Fruit Graded Out

U. S. Fancy - 14%
U. S. No. 1 - 47%
U. S. Utility 0 39%
Ciders - 10%

Utility was due to poor color
Ciders, small fruit, aphis apples, and drops

Costs

9.8¢ per spray per tree
50¢ per tree per season

The demonstration plot in Rappahannock county was located in Mr. Richard Miller's orchard. The trees were of the York Imperial variety. Mr. Miller has not been able to get control of scale in this orchard. The infestation was extremely heavy. The trees are large and are thick and brushy. They need a good thinning out type of pruning. The orchard is located on steep, rough slope. A three per cent oil emulsion of unknown reputation was used in this case. The full calendar of sprays was applied. The control was only moderately good. The infestation of San Jose scale was materially reduced by the sprays, but the control was only moderately good. The Scab and worm control was very good. The demonstration will be repeated in 1932.

The demonstration plot in Nelson countywas located in the orchard of Mr. McClain. The trees are large, consisting of Winesap and Blacktwig varieties. Mr. McClain has not been able to control scab in former years. The full calendar of sprays was applied though the equipment was not of sufficient kind to cover the tops of the large trees properly without wasting the materials. The results were excellent, but the cost was slightly high.

Narrative

Results

Scab - trace
Worms - trace

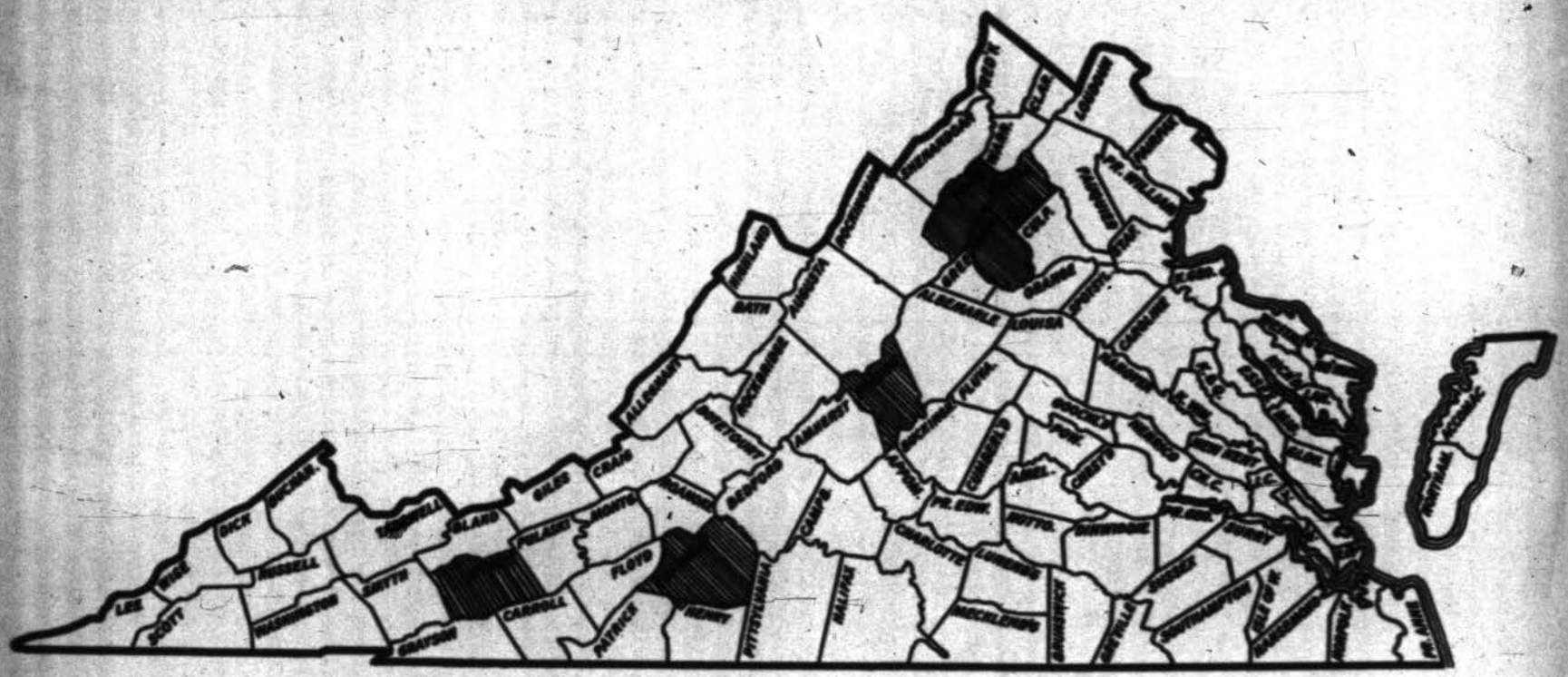
How Fruit Graded Out

U. S. Fancy - 37%
U. S. No. 1 - 36%
U. S. Utility - 21% - because of color
Culls - 6% - size and drops

Costs

11.5¢ per spray per tree
69¢ per tree per season

The results in these demonstration plots are evidence to the efficienty of the spray program whenapplied properly. In each case the owner was well pleased and stated that they had been able to do a better job of sprayingthin every case considerable more material has been used. It is especially gratifying to note that in all of these plots codling moth control has been unusually good in spite of the fact that 1931 has been a good codling moth year.



SPRAYING DEMONSTRATIONS PLOTS

Summary of Spraying Demonstrations

Number given	29
Number in attendance	324
Night meetings	5
Attendance	190
Advisory visits on spray inquiry	10

As a result of the night meeting in Orange county, fruit growers have turned from the use of dry lime-sulphur to the use of liquid lime-sulphur at a tremendous saving. Previous to this time the cost of the dry lime sulphur kept them from applying enough materials, with the result that the per cent of blemished fruit has always been large, because of poor insect and disease control. This year the per cent of insect and diseased fruit was small.

As Mr. Watson did most of the work connected with the spraying demonstrations, and demonstration plots, he is deserving of most of the credit for the splendid results secured.

Rodent Control Project - Mr. J. P. Watson in Charge. Another important subproject under production is that of rodent control. For most economical production every tree space in the orchard should be occupied by a vigorous, healthy tree. Every vacancy means definite reduction in potential yield. A sick or dying tree is more costly than a dead tree because such trees are sprayed, fertilized, and cared for the same as a healthy tree. Trees injured by mice soon become weak and sick. A sick or weakened tree is not able to produce good fruit. Such trees are a big expense rather than an asset.

During the past three years special attention has been given the eradication program. The results have been excellent. Growers are beginning to adopt a regular system of combating these little robbers. Poison bait is distributed at regular intervals. Injured trees are being repaired by bridge grafting.

This year again poison bait could be purchased from the Federal Mixing Plant in Idaho, at cost. As in the past, the department has enjoyed the closest cooperation and assistance of Mr. James Silver, leader in Rodent control work for the eastern district of the United States.

In putting this project across the usual method is to send out circular letters to the growers in advance of the danger period giving information as to the degree of activity that may be expected and warning them of what might be expected. Demon-

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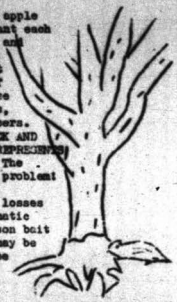
COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS
State of Virginia, Va. A. & M. College and Poly. Inst. & U.S.D.A. Cooperating
EXTENSION SERVICE

When the poison is away,
These mice make hay.

Dear Mr. Fruit Grower:



Umm, so that's where my orchard profits go. Well, poison bait will stop that I know. I'll order it right now!

The problem of marketing our apple crop is becoming more important each year. More and more foreign and domestic markets are demanding quality fruit. It is not possible to produce apples of good size and color from mouse injured trees. Only vigorous, healthy trees are good producers. EVERY VACANT SPACE, EVERY SICK AND INJURED TREE IN THE ORCHARD REPRESENTS A DIRECT LOSS TO THE OWNER. The mouse problem is a marketing problem!

The best way to stop orchard losses from mice is through a systematic rodent control program. Poison bait has given good results. It may be prepared at home, or it may be purchased at cost through this office from the U. S. Department of Agriculture. Last year many thousands of pounds of this prepared bait were distributed to Virginia growers at cost. The same plan will be continued this year. The price of the bait this year is 8¢ per pound in 100-pound lots, sacked in 25-pound bags, and 8½¢ per pound when put up in 10-pound bags. These are f.o.b. prices McCammon Idaho. Checks for the bait must be sent with the order and be made payable to the RODENT CONTROL STATION FUND. No order for less than 100 pounds will be accepted for any one shipping point.

Growers should be on the look out for the presence of mice in the orchard. All growers in the county who are having trouble with mice should fill out the order blank below. It is suggested that 2 pounds of the bait be ordered for each acre of orchard. It is recommended that three applications of poison bait be made between this time and March 1, using 1 pound per acre for the first application, which should be made as soon as possible, one-half pound in the latter part of January, and one-half pound per acre March 1.

Demonstrations for putting out the bait and placing bait stations will be given in connection with the first application upon request from your county agent.

Yours very truly,

County Agent

To the County Agent:

Please find enclosed my check for $_____ made payable to the RODENT CONTROL STATION FUND for _____ pounds of field mouse poisoned bait to be shipped to me by freight collect to the address below:

Name _____

Mail Address _____

Freight Address _____

structions in applying the bait and the various kinds of stations that may be used are taken up at field meetings which are arranged for by the county agents. Growers have shown a great deal of interest in this project and are well pleased with the success they have had since the mouse eradication has been brought to their attention. In many orchards mice have been completely eradicated.

Results Although fruit growers have had two rather discouraging years they purchased more than 18,000 pounds of Government poison bait in 1931.

Poison Bait Demonstrations	7
Attendance	81
Grafting Demonstrations	8
Attendance	85

Outlook The mouse problem as a result of the special eradication program of the past three years, is less serious than it has been for many years. If growers will continue in the future at the pace set in 1929, 1930, and 1931 the losses from this source will not be serious.

Pruning - J. H. Teske in Charge The past marketing season has again demonstrated that with increased fruit production of the different kinds, low grade fruit handicaps materially the movement of the better grades and demoralizes markets. It is, therefore, most important that Virginia growers produce a larger percentage of the higher grades and less low grade fruit. Proper pruning plays a most important part in the production of high grade fruit. This orchard operation requires more real horticultural knowledge and good judgment than any other orchard practice if the best production is to be secured over a long period of time.

In almost any of our older apple orchards can be found trees with from one-fourth to three-fourths of the bearing surface broken away because of improper pruning during the training or structure building period of the trees life; that is, the first four or five years after the tree is planted. In order to avoid such mistakes in the new plantings, long time pruning demonstrations have been started with nearly trees in several orchards in ten counties. It is planned to put this type of demonstration in all the important fruit counties, especially in those sections where new plantings are being made. These demonstrations include both apples and peaches. They consist of acre plots in most cases and are so arranged as to take in the different varieties because varieties differ in habit of growth.

It is intended to hold pruning demonstration meetings in these orchards for four or five years. In this way demonstrate training of trees for strength and capacity. It also provides examples to which growers may return for reference and study at any time. Under this type of demonstration growers are given an opportunity to follow the trees throughout the training and developing period.

Growers are beginning to realize the important part pruning plays in the production of quality fruit, size, color, etc. Many growers do not have clearly in mind the objects sought in pruning. For this reason our pruning demonstrations are first preceded by a brief discussion of the principles involved and the objects. How to secure mechanical strength. How to secure good distribution of good fruiting wood. The principles are then demonstrated and reasons are given for all cuts made, pointing out if you have no good reason for making the cut, it is better left alone. Finally, growers are asked to do the actual pruning. This is a good way to break through their reserve and start lively discussions and create interest.

Pruning is not confined to the long time demonstrations, but covers all ages of trees and includes demonstrations with nuts, grapes, shade trees, and small fruits.

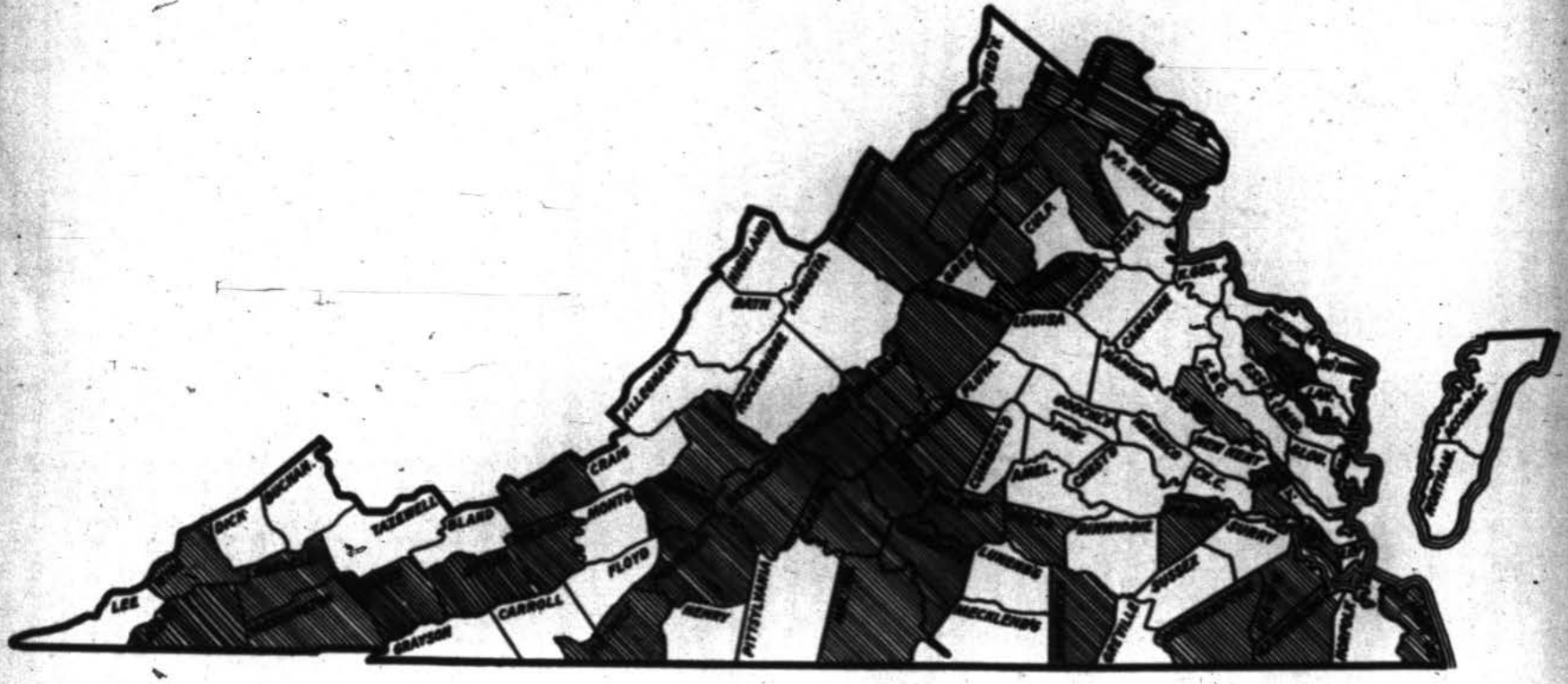
Material is also being collected to be used in a bulletin on pruning. It was thought that it could be completed this year but increase in the number of requests has made it necessary to postpone this for the present.

The goal for this project was to hold 35 apple pruning demonstrations and 30 peach pruning demonstrations.

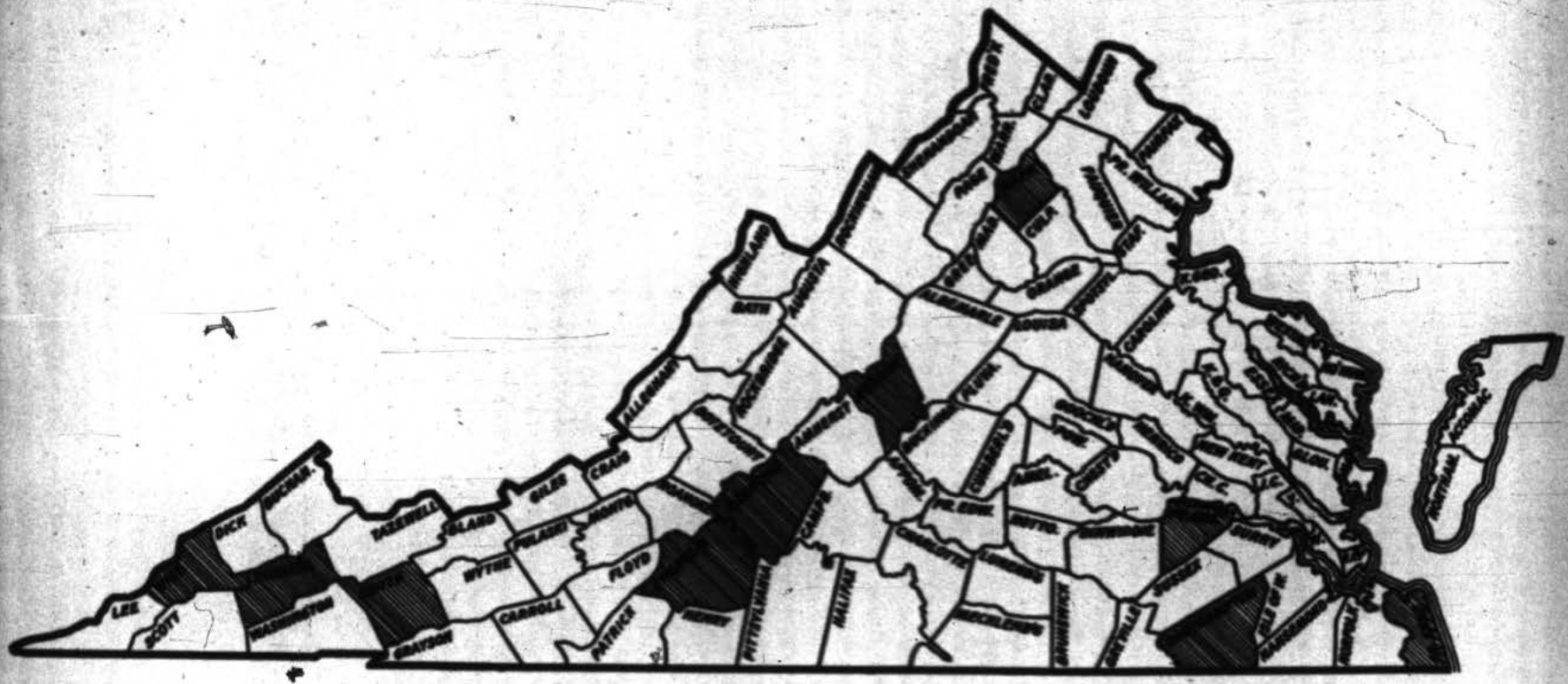
Results - Long time pruning demonstrations were established in seven counties.

Apple demonstrations	71
Attendance	867
Peach demonstrations	47
Attendance	306

Outlook - The outlook is brighter than ever before for real results from pruning demonstrations. Growers are becoming more seriously interested in this project because they realize that if they are to derive a profit from their enterprise in the future they must produce larger yields of better fruit.



PRUNING DEMONSTRATIONS



PERMANENT PRUNING DEMONSTRATIONS

Fig. 1. PRUNING DEMONSTRATION ON OLD PEACH TREES SHOWING TREES BEFORE PRUNING. COMPARE WITH Fig. 2

Fig. 2. PRUNING DEMONSTRATION ON OLD PEACH TREES SHOWING SAME TREE AFTER PRUNING. COMPARE WITH Fig. 1

Fig. 1. SEMLEH OF TWO FIGURES IN PERMANENT PEACE FIGHTING DEMONSTRATION. LOW HEADED TREES

FIG. 2. SERIES OF TWO FIGURES IN PERMANENT PHASE PUSHING DEMONSTRATION. HIGH HEADED TREES

Thinning Project - Mr. R. A. Tucker in Charge. The time has passed when the commercial fruit grower can depend upon nature to relieve the over-burdened condition of heavily loaded fruit trees and to take the chances of having a large amount of undersized, poorly colored, and blemished fruit to confront at harvesting time. Under present conditions fruit thinning is usually a very profitable orchard operation and by the most successful commercial growers is considered almost as essential as spraying.

Thinning is not only important in increasing size and grade, improving color and quality but aids in decreasing the labor in harvesting the crop and most important of all, it reduces the amount of low grade fruit.

Thinning is especially important on mature trees and with those varieties that have a tendency to set in clusters.

Due to the drought and other climatic conditions in 1930 the apple crop was materially reduced, the peach crop was almost a total failure, consequently, there was little need for thinning demonstrations. Good care and ideal weather conditions in 1931 caused the trees to set a heavy crop of fruit. This was true for almost all fruit sections throughout the state. Trees, both peaches and apples, were loaded so heavily that it would be impossible for the fruit to develop properly size if all was allowed to remain on the trees. Further it was realized that it would be impossible to market peaches that were less than two inches in diameter. Members of the department felt that it would be necessary to put on a campaign in thinning of fruit if proper size was to be harvested.

A series of thinning demonstrations were arranged for in most of the important fruit sections. In these demonstrations trees were selected and a tree or so was thinned by the specialist. Then those in attendance were asked to help in the work. Each person was given instructions how the fruit should be removed, how to space the fruit, and how to select the fruit which should come off. Besides demonstrations, growers were urged to this through radio talks and news articles.

Some growers were afraid to thin to the proper distance, but later expressed themselves as having lost money by not thinning more. One grower stated that it had cost him $6,000 to thin his apple crop and said that if he had spent $6,000 more his returns would have been larger. Most excellent results were secured by growers from thinning.

The following is the result of one of the thinning demonstrations. The grower was rather skeptical about the outcome. One tree was thinned by the specialist according to recommendations, another tree was left unthinned. The record was

taken by a disinterested party. Time and weather of some years did not permit the taking of records on thinning plots as had been planned, for as the time these demonstrations were arranged.

Results of Thinning Demonstration in Franklin County

Lot of 6 barrels off unthinned trees:

25 baskets U. S. No. 1, 2½ in. and up
2 baskets U. S. No. 1, 2½ in. to 2½ in.
1 basket U. S. No. 1, 2 in. to 2½ in.
1 basket U. S. Utility 2½ in. and up
1 basket U. S. Utility 2½ in. to 2½ in.
1 basket U. S. Utility 2 in. to 2½ in.
½ basket culls

In U. S. number one lot 8½% of grade defects consisting of 3% scab, 3% russetting, 2½% misshapen and insecture stock.

80% to 90% good red color, most 85% to 90% good red color, condition hard and firm. No decay.

Lot of 6 barrels off thinned trees:

11 baskets U. S. No. 1, 2½ in. and up
4 baskets U. S. No. 1, 2½ in. to 2½ in.
1 basket U. S. Utility, 2½ in. and up
1 basket U. S. Utility, 2½ in. to 2½ in.
2 basket U. S. No. 1, 2 in. to 2½ in.
1½ basket Utility, 2 in. to 2½ in.
½ basket culls

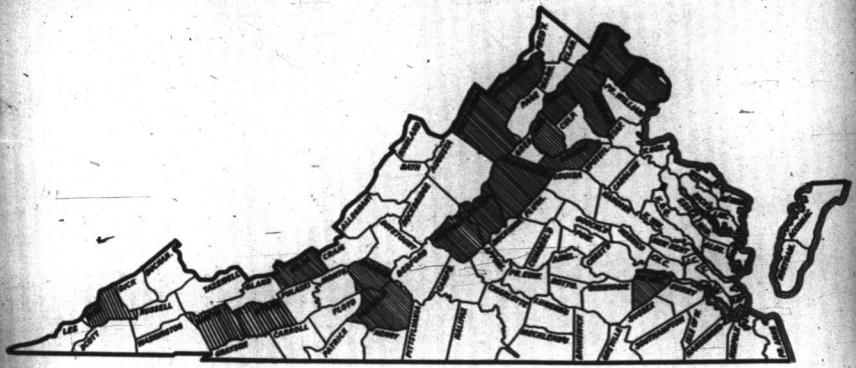
In U. S. No. 1 lot 8½% of grade defects consisting of 3% scab, 3% russetting, less than 1% misshapen from insecurity.

80% to 90% full red color, mostly 85% to 90% good red color, no decay, condition hard and firm.

Accomplishments

Apple thinning demonstrations	21
Attendance	321
Peach thinning demonstrations	30
Attendance	468
Counties in which demonstrations were held	19

Outlook. The outlook for thinning to become a regular practice for apples as well as peaches is very good. As a result of the demoralized markets this season because of low grade fruit, there is a movement in operation at present to eliminate



THINNINS DEMONSTRATIONS

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COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS
State of Virginia, Va. A. & M. College & Poly. Inst. & U.S.D.A. Cooperating
EXTENSION SERVICE

Blacksburg, Va.
May 27, 1931

To Agent Addressed:

The danger of frost to our fruit crop is just about over. The danger of producing a crop which is inferior in quality and size is just beginning to become apparent. This is especially true for peaches.

In 1930 peach prices were good Virginia growers did not share in this because of the very small crop in this state.

1929 was a disastrous year for Virginia growers. The trade very forcibly made it known that they did not want wormy or small peaches. The chances are that peaches less than two inches in diameter will not profit growers this year.

Our big job is to help our growers produce peaches that will meet with favor on the market at a price above the cost of growing. The big problem will be thinning the fruit to obtain sufficient size.

In order to get the situation over to the grower we want to schedule thinning demonstrations in every peach growing community. We want to start these demonstrations early in June, as the crop in many instances is so heavy that unless the trees are given relief there will be considerable damage to them from breakage.

Apple thinning demonstrations will be given during the first part of July.

Please notify the V.P.I. Horticulture Department as to the number of thinning demonstrations that you would like to schedule for your county and the most convenient dates.

Yours very truly,

W P Moore

Asst. Director

WPM:MPM

the unclassified grade, if this does, growers will make greater efforts to grow more quality fruit. Thinning should play an important part in this.

Pollination - A. H. Thaden in charge. Most of the standard apple varieties grown in Virginia are self-sterile and a number are inter-sterile. That is, the pollen of certain varieties will not fertilize the flowers of others. In many of our commercial orchards these varieties are planted in large blocks. In some instances whole orchards are planted to inter-sterile varieties. These orchards are low producers, therefore, lose money for their owners constantly. Production costs are very high which makes it impossible for them to compete with better yielding orchards.

Since the question of pollination was not given proper attention in these orchards at planting time it is necessary to topwork some of these to varieties that are good pollinizers and to provide agencies by which this pollen may be distributed. Bees are the most useful for this purpose. Topworked trees require three or four years to produce bloom. For temporary relief baskets containing blooming branches may be distributed throughout the orchard and if bees are also placed in the orchard, good results can be secured.

Because of the great economic importance of this project, considerable time was given this work during the past year. In cooperation with Mr. Featherford, Extension Bee Specialist of the Entomology Department, several demonstrations were conducted and splendid results secured.

Description and results of demonstrations follow.

Demonstration No. 1 was conducted in a twelve year old apple orchard in Shenandoah county. There are about twenty acres in this orchard and almost solidly planted to the Stayman Winesap variety. Three trees of about equal size and carrying about the same number of bloom buds, were selected and a wire screen cage built around each one, the wire mesh was fine enough so that it was fly-proof. The trees were caged before any of the blossoms had opened. In one cage a bouquet of Grimes Golden blossoms was placed but no bees were put in the cage.

In cage No. 2, in addition to a bouquet of Grimes Golden blossoms a hive of bees were put in.

In cage No. 2, a hive of bees was placed the day before the trees came into bloom. The results of harvesting them were as follows:

Tree No. 1 (caged with Crimson Golden blossoms)	1 doz. apples
Tree No. 2 (caged with bees and Crimson Golden blossoms)	6 crates of fruit
Tree No. 3 (caged with bees)	10 crates of fruit

This interesting demonstration shows how important it is to interplant self-sterile varieties with good pollenizers and how important bees are in the orchard planting.

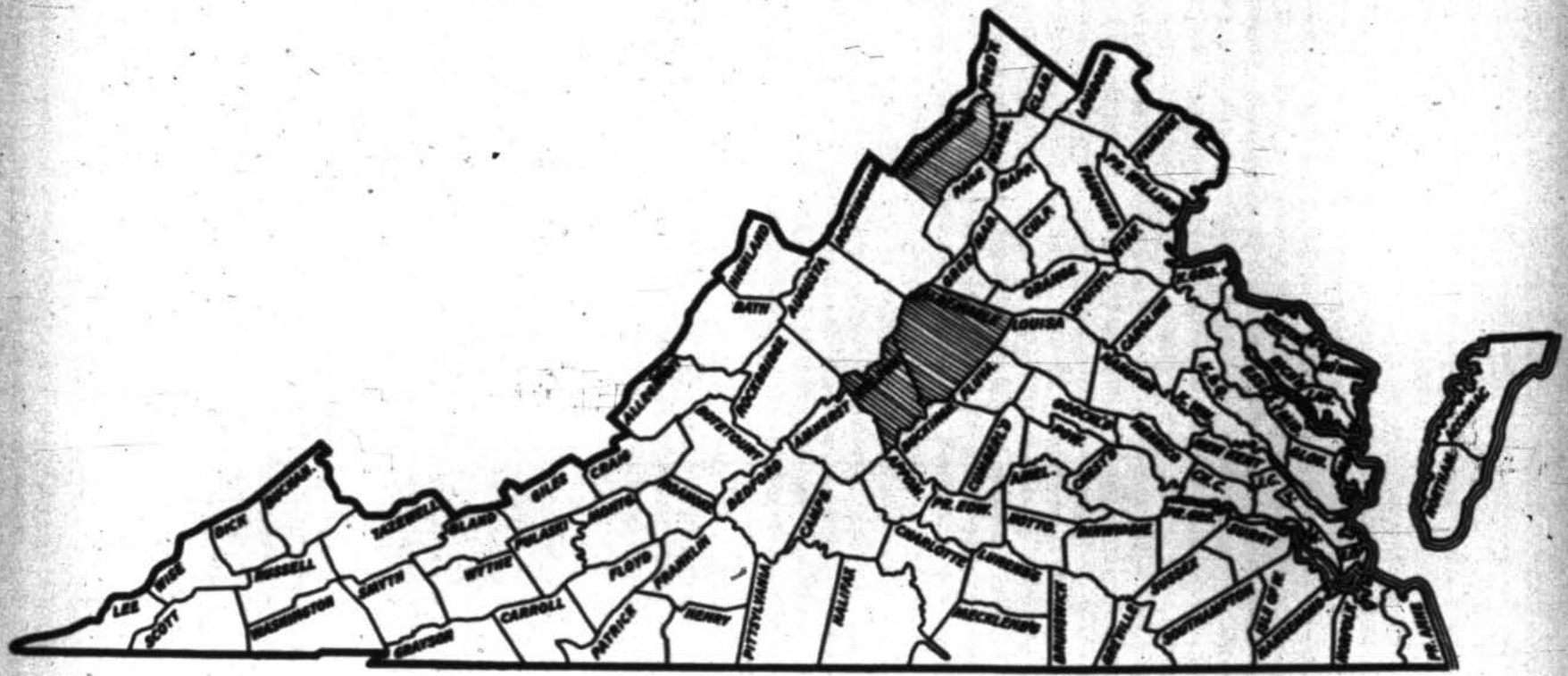
Demonstration No. 2 was conducted in an orchard belonging to the Shipman Orchard Co., in a solid block of twenty-five hundred Winesap trees. These trees are about twenty years old and have never borne a paying crop.

In the spring of 1931 bees and blossom bouquets were distributed through the orchard under the direction of the horticultural specialist. The result was that the orchard produced the most satisfactory crop since it has occupied the ground.

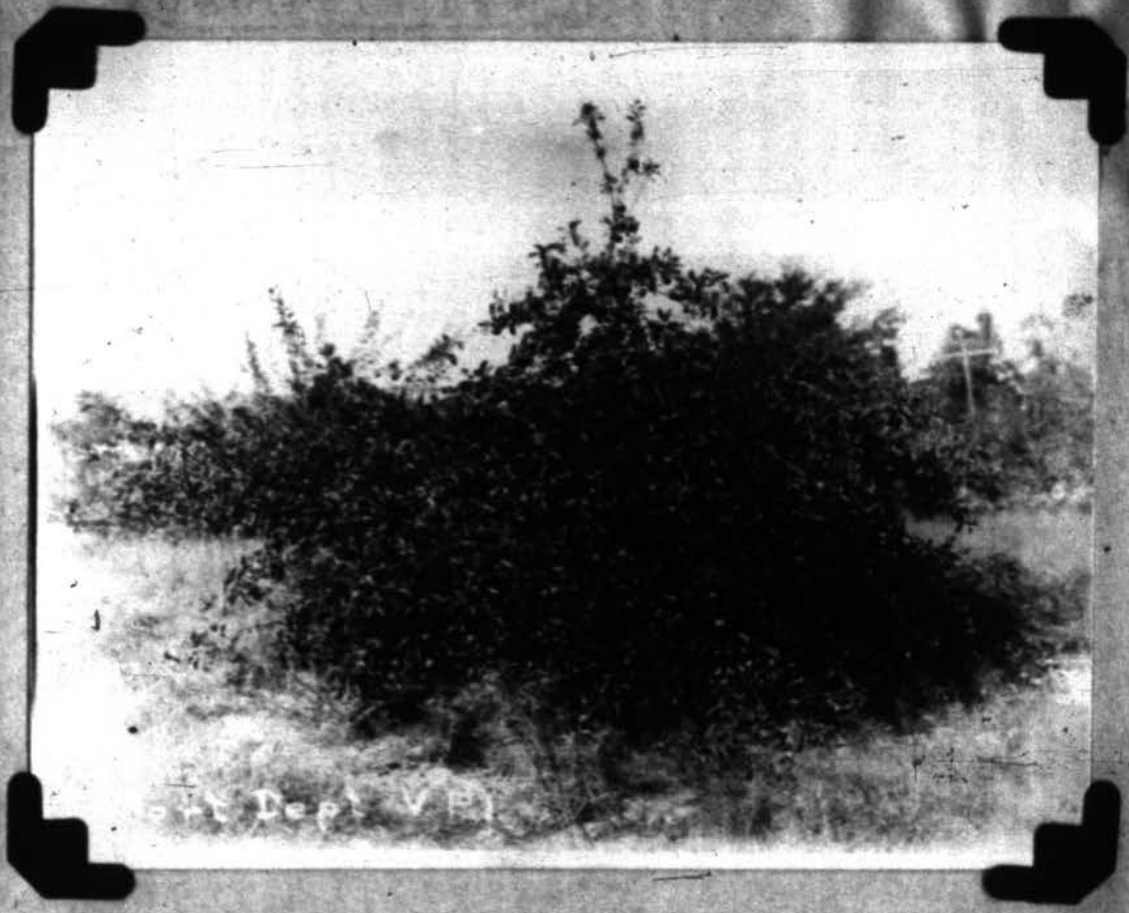
Demonstration No. 3 was conducted in Mr. Owen's orchard in Albemarle county. This orchard is carefully planted to Stayman Winesap and Winesap varieties. These varieties are not only self-sterile, but inter-sterile as well. Buckets of blossoms of a good pollinizing variety were hung in the trees, bees were distributed through the orchard. A good crop of fruit was produced. The set of fruit was much larger in the immediate vicinity of the buckets containing the blossoms. (See exhibit.) A budding demonstration was also carried on in this orchard.

Buds of Ben Davis and Richared were budded into several small branches in every other tree. These, it is planned, will be sufficient to take care of the problem in a few years.

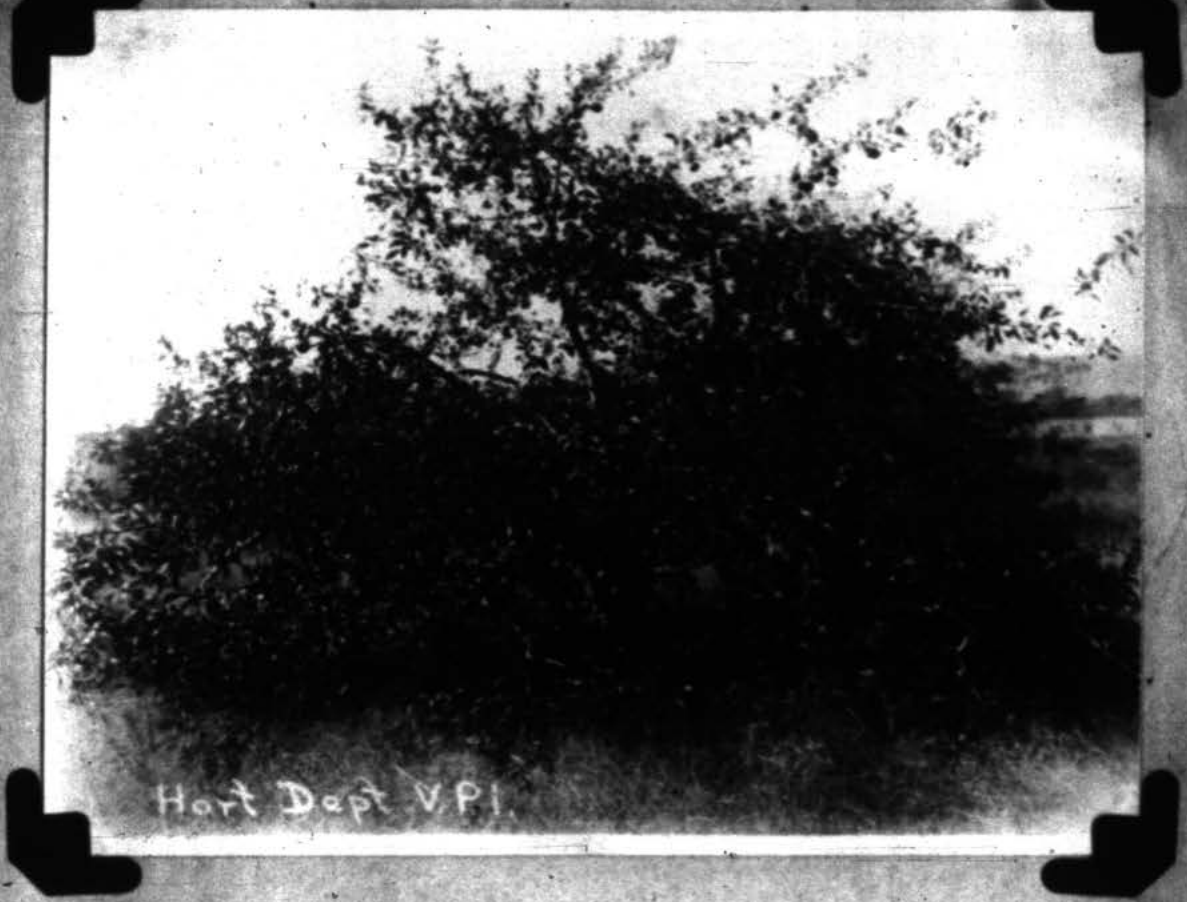
Demonstration No. 1 - In the orchard of Mr. Green of Albemarle county bees and bouquet were distributed in his orchard under the department's direction with excellent results. In addition, twelve topworking and budding demonstrations were given. There were 75 in attendance. More than one thousand packages of bees were purchased by growers. Many other growers rented or bought bees. The results of the pollination work has been outstanding.



POLLINATION DEMONSTRATIONS



TREE NO. 8 IN POLLINATION SERIES
TREE NOT A COLONY OF BEES IN CAGE AND GRIMES BLOSSOMS
YIELD SEVEN CRATES OF FRUIT



TREE NO. 5 IN POLLINATION SERIES
TREE NO. 5 COLONY OF BEES PLACED IN CAGE NIGHT BEFORE BLOSSOMS OPENED
YIELD TEN CRATES OF FRUIT

NOTE HEAVY SET OF FRUIT NEAR BLOSSOM BUCKET

BUCKEYE GIVE BLOSSOMS INCREASED YIELD FOR MR. OWENS

BUDS AND BLOSSOMS ARE RESPONSIBLE FOR MORE FRUIT IN TOPS OF TREES

<u>The Outlook</u>   From the work of the demonstrations given in 1931, growers were able to see with their own eyes just what blossoms of the right kind and bees can do for them in the way of increasing yields.

<u>Cultural Methods Project - A. H. Teske in Charge</u>   The drought of 1930 demonstrated as never before the importance of organic matter in orchard soils. Not only does organic matter mean more food for the trees, but a uniform supply of moisture during the growing and fruit developing period, better sized fruit, better colored fruit, larger annual yields of better quality. That growers are realizing this is shown by the larger number of requests that have come in during the past year for orchard visits and surveys. When such visits are made the orchard is gone over in detail. The past history of the orchard is taken into consideration. Definite recommendations are made for each orchard as every orchard presents a different problem. The plans of work stress increasing the organic matter and water holding capacity, and improving the physical condition of the soil which in turn will give better growth of trees, better yields, and better quality fruit at less cost.

<u>Orchard Management Demonstrations</u>

<u>Demonstration No. 1</u>   At the present time, we have three permanent orchards in which we plan the practices that are used. One of these is located in Shenandoah county and has been going for three years. This orchard was taken over as a rented orchard in 1929. The orchard had not been producing profitable crops. The fertility had been depleted, the soil in many places had washed to the extent that there were numerous gullies in all parts of the orchard, tree growth had been stunted.

A survey was made and a detailed plan of work outlined. The recommendations have been carried out to the letter. The result is that the orchard has had a crop every year since. The trees suffered very little during the dry season of 1930. The fruit attained good size and color. The same was true during 1931. A good part of the orchard is planted to Stayman Winesap, a variety which does not color any too well under adverse weather conditions; it also has a tendency to crack badly. 1931 was a poor year for this variety, however, in this orchard the fruit of this variety not only colored up well, and developed in size, but there was little cracking.

Demonstration No. 6 At the time of beginning the demonstration work this orchard which is located in Alexander county, part of the orchard was interplanted, in another part of the orchard the fillers (peach and persimmon) trees were planted so closely that the filler trees of thirteen (13) years were growing better than the permanent thirteen trees and much crowding was taking place.

A survey was made and a plan of work was outlined. The recommendation called for taking out the peach trees and a particular type of pruning for the crowded condition as well as detailed methods of soil treatment.

The results have been gratifying to both the extension workers and to the owner. Yields have increased, quality of the fruit has been raised, and costs have been lowered.

Demonstration No. 8 This orchard is in Smyth county and was only taken over as a result demonstration in 1931.

These orchards are used for pruning, rodent control, bridge grafting, and other demonstration meetings during the year and affords splendid opportunities to point out what results are to accrued when such management methods are used.

Results Advisory visits and surveys were made to 170 orchards during the year in 20 counties. Plans of work with recommendations filling each problem were submitted.

Outlook While the year 1931 has been a strain on grower finances, especially on peach growers who have had three bad years, orchard recommendations have been carried out better than ever before. Several orchards have been permanent legume covers, sweet clover, etc., and in almost all cases the annual cover crops have been put in as directed. This means a soil building program. The outlook is bright and plans are to push this project in the future. Results from the long time orchard management demonstrations are helping materially to put this work across.

Fertilizer Demonstrations - J. H. Yoder in Charge Fruit trees thrive and are productive on adequate supplies of mineral and air foods are available. Many of our orchards are suffering from starvation because certain plant food elements are not being supplied the trees. The result is poor set of fruit, poor color, and quality. That growers are realizing this is shown by the rapid increase in the use of fertilizer, especially those carrying nitrogen, the element which has given the greatest re-

ELAM & FUNSTEN
Real Estate and Insurance
1108 E.Main St.
Richmond, Va.

July 15, 1931

Mr. John R. Hutcheson,
Director of V.P.I. Extension Work,
Blacksburg, Virginia.

Dear Mr. Hutcheson:

I appreciate very greatly your recent letter and especially the one written to me by Mr. Tesko. He replied most intelligently to my inquiry and I want to say here that he has been of untold help to Mr. Sandy and to me in the information he imparted to us in regard to pruning, spraying, and cultivating of our orchards as well as other matters in this connection and I think he is certainly very thorough and most practical in his suggestions and he and Mr. Watson have injected into the management of our place a personal interest and this has been of untold benefit to Mr. Sandy and his son who so ably direct the place.

Your department has been most helpful to the people of Virginia and I want to congratulate you on your work as well as your complete and capable organization.

With best wishes, I am

Yours sincerely,

(Signed) O. H. Funsten

OHF/fw

ORCHARD MANAGEMENT ON PEACHES
LONG-TIME DEMONSTRATION

Fig. 1. RECENT DEMONSTRATION IN ORCHARD MANAGEMENT POORLY LOCATED PECAN GROVE BEING INTERPLANTED WITH PEACHES. COMPARE WITH FIGS. 2 AND 3

Fig. 8. RESULT DEMONSTRATION IN ORCHARD MANAGEMENT GROWER'S TREATMENT BLOCK. COMPARE WITH FIG.5

Fig. 3. RESULT DEMONSTRATION IN ORCHARD MANAGEMENT SPECIALIST'S TREATMENT BLOCK. COMPARE VIGOR OF TREES IN FIG. 2

spoons. This increased used of fertilizer has come about largely because of results from demonstrations which have been outstanding. Nitrogenous fertilizers have been used most. Phosphates are also recommended, and have given good results indirectly by increasing the growth of the cover crop. Nitrate of soda has been the form of nitrogen used most. Recently, sulphate of ammonia and cyanamid have made considerable progress chiefly, perhaps, because of lower cost per unit.

Demonstrations with all three of these materials have been carried on during 1931 in cooperation with the educational bureaus of the manufacturing companies. Demonstrations with both spring and fall applications were used.

In previous years records were secured from the demonstration plots at harvesting time. This year, however, it was found impossible to do this for two very good reasons: First, growers have been convinced what the fertilizers will do, and knowing that the drought had left the trees in a weakened condition, many went ahead and applied fertilizers to the balance of the orchard. Second, the rush of work on packing, grading, and reading prevented us from getting these records with our present force of help. It was thought that grading and packing demonstrations were of greater importance this year.

Orchards in which demonstrations were conducted are as follows:

Owner			
R. B. Hurst	Flint Hill, Va.	Apples	Applied Dec.8,1930
Roland Lee	Monroe, Va.	Apples	Applied Oct.20,1930
Mrs. C. D. Wood	Flint Hill, Va.	Apples	Applied Feb. 1931
Judge Tavenner	Woodstock, Va.	Apples	Applied Feb. 1931
Judge Tavenner	Woodstock, Va.	Apples	Applied Nov.6,1931
Dave Reardon	Winchester, Va.	Apples	Applied Sept.30,1931
Dave Reardon	Winchester, Va.	Apples	Applied Feb.1,1931
Dave Reardon	Winchester, Va.	Apples	Applied Mar.1,1931
E. M. Geyer	Blackstone, Va.	Peaches	Applied Feb. 1931
E. M. Geyer	Blackstone, Va.	Peaches	Applied Nov. 1931
Roland Lee	Monroe, Va.	Peaches	Applied Oct. 1931
Mr. Hufner	Hopewell, Va.	Peaches	Applied Nov. 1931
Downing Wood	Washington, Va.	Peaches	Applied Nov. 1931
Mrs. C. D. Wood	Flint Hill, Va.	Peaches	Applied Nov. 1931

Demonstrations to determine results from Sterilized Ground Tobacco Stems:

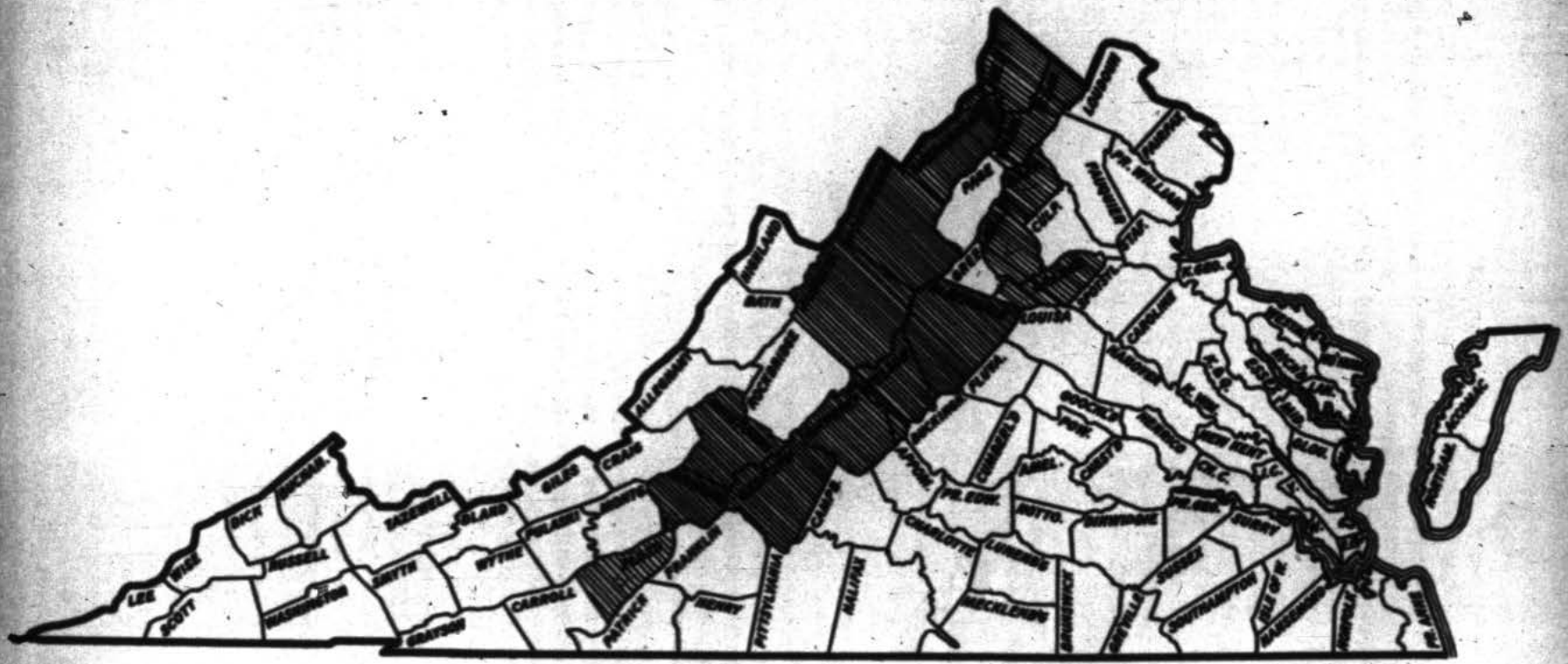
J. A. Nicodemus	Winchester, Va.	Apples	1,000 pounds

[illegible] Brothers	Winchester, Va.	Apples	2,000 pounds
Harry F. Byrd	Berryville, Va.	Apples	2,000 pounds
[illegible] Bros.	Winchester, Va.	Apples	2,000 pounds
C. C. Bowman	Mt.Jackson, Va.	Apples	1,000 pounds
Gordon Bowman	Mt.Jackson, Va.	Apples	2,000 pounds
R. W. J. Hoverty Co.	Mt.Jackson, Va.	Apples	2,000 pounds
Frank Winsler	Mt.Jackson, Va.	Apples	2,000 pounds
W. H. Tysinger and Vanmeter	Mt.Jackson, Va.	Apples	2,000 pounds
T. B. Byrd	Timberville, Va.	Apples	2,000 pounds
Geo. Holsman	Mt.Jackson, Va.	Apples	2,000 pounds
Valley View Orchards	Harrisonburg, Va.	Apples	1,500 pounds
Rose Hill Orchard	Harrisonburg, Va.	Apples	1,500 pounds
W. H. Sprinkel	Harrisonburg, Va.	Apples	1,500 pounds
Spotswood Orchard	Harrisonburg, Va.	Apples	1,500 pounds
Sam H. Berry	Harrisonburg, Va.	Apples	1,500 pounds
J. H. Wickersham	Harrisonburg, Va.	Apples	2,000 pounds
W. T. Snodgrass	Charlottesville, Va.	Apples	2,000 pounds
R. H. Hurt	Crozet, Va.	Apples	6,000 pounds
McCue and Son	Greenwood, Va.	Apples and Peaches	4,000 pounds
J. W. Montague	Crozet, Va.	Apples and Peaches	6,000 pounds
Red Apple Orchard	Shipman, Va.	Apples	2,000 pounds
Crumpacker Bros.	Roanoke, Va.	Apples and Peaches	6,000 pounds
Hininger Orchard	Cloverdale, Va.	Apples and Peaches	6,000 pounds
F. H. Hofmann	Blacksburg, Va.	Apples	18,000 pounds

Demonstrations to determine results from Nitrate of Soda:

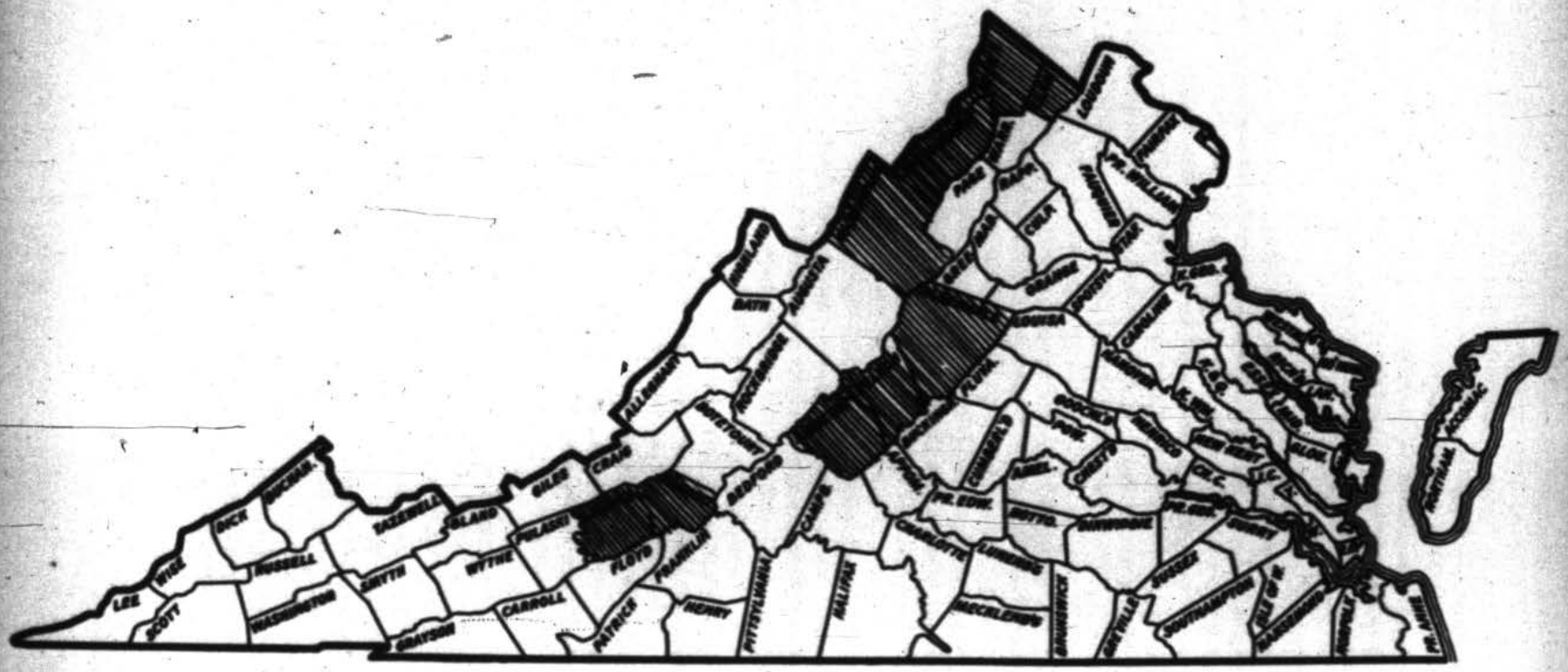
Albemarle	A. E. Richards	Charlottesville, Va.
Albemarle	J. L. Ross	Charlottesville, Va.
Amherst	W. T. Campbell	New Glasgow, Va.
Amherst	R. S. Cunningham	Amherst, Va.
Amherst	Sweet Briar Orch.	Sweet Briar, Va.
Augusta	Dr. S. C. Hiff	Staunton, Va.
Augusta	S. H. Moore	Stuarts Draft, Va.
Bedford	Roanoke Orchard	Montvale, Va.
Bedford	Mrs. C. T. Venable	Bedford, Va.
Botetourt	R. S. Ikenberry	Daleville, Va.
Botetourt	Chas. J. Kinzie	Troutville, Va.
Clarke	J. H. Funkhouser	White Post, Va.
Clarke	Mrs. W. H. Rutter	Berryville, Va.
Floyd	H. H. Poff	Floyd, Va.

Frederick	Charles Cooper	Stephenson, Va.
Frederick	Alvin Richards	Winchester, Va.
Frederick	H. C. Graves	Gore, Va.
Grayson	J. H. Parsons	Independence, Va.
Frederick	J. I. Wise	Middleton, Va.
Madison	H. V. Beal	Griggleroville, Va.
Nelson	Mrs. T. J. Hurley	Lovingston, Va.
Nelson	Henry T. Page	Greenville, Va.
Orange	R. L. Voss	Somerset, Va.
Orange	T. C. Sampson	Gordonsville, Va.
Rappahannock	Miss Mamie Eastham	Flint Hill, Va.
Rappahannock	William Slak	Washington, Va.
Roanoke	H. L. Kirkwood	Roanoke, Va.
Roanoke	S. L. Roberts	Salem, Va.
Rockingham	G. A. Bowers	Timberville, Va.
Rockingham	J. S. Ralston	Mt.Clinton, Va.
Shenandoah	H. M. Arts	Woodstock, Va.
Shenandoah	G. C. Bowman	Mt.Jackson, Va.
Warren	C. H. White	Linden, Va.



FERTILIZER DEMONSTRATIONS

NITRATE OF SODA



FERTILIZER DEMONSTRATIONS
TOBACCO

Mr. J. D. Martin, manager of Boyce orchard for Mr. B. H. Knight of Winchester, Va. Mr. Martin is shown examining a young Golden Delicious tree that was fertilized with Cyanamid and has a heavy crop. Mr. Martin is a good manager and his heavy crop on all varieties this year has made him a booster for Cyanamid.

Variety York.... Orchard of Dr. B. M. Knight, Winchester, Va. Fertilized with Cyanamid in March 1931.

Varieties York, Delicious, Bonum, Staymen and Black Twig .. Orchard of Mrs. G. D. Woods, Flint Hill, Va. Fertilized with Cyanamid in March 1931, Picture [illegible] 1931.

Variety Black Twig.... Orchard of J. A. Nicodemus, Winchester, Va. Mr. Rose, manager, fertilized with Cyanamid 4 pounds per tree applied in March, 1933 - with a Niagara Dusting Machine.
Permanent trees 60 feet apart with Fillers planted in the middle at 30 feet.
Cover crops and clean cultivation practiced.

Variety Arkansas Black .... Orchard of Dr. B. H. Knight, Winchester, Va.
Fertilized with Cyanamid.. Note the heavy growth of cover crop.

Variety York.... Showing heavy crop in orchard of Fred Glaize, Winchester, Va. Fertilized in March, 1931 ... applied with a dusting machine, 4 pounds per tree of Cyanamid.

Variety York.... Orchard of Fred Glaize, Winchester, Va. Fertilized with 4 pounds per tree of Cyanamid applied with a dusting machine in March, 1931.

Variety York.... Orchard of Fred Glaize, Winchester, Va. Fertilized with 4 pounds of Cyanamid applied with a dusting machine in March, 1931.

NITRATE OF SODA INCREASED THE SET OF FRUIT

NITRATE OF SODA INCREASED THE TERMINAL GROWTH

NITRATE OF SODA "RESULT" NET INCREASE 6 CRATES PER TREE

PROPER FEEDING "RESULT" MORE HUMUS BETTER TREE GROWTH

Grading and Packing Project - H. A. Tucker in Charge In addition to the sectional meetings, Horticultural specialists were active in the field giving grading and packing demonstrations throughout the harvesting and marketing season.

These meetings were usually held in packing houses while the grading and packing were in actual progress. The procedure was for the specialist to discuss briefly the market situation, the importance of a dependable pack, and explaining the different grades. After this, several crates of fruit were graded into the different grades, giving reasons why certain fruits were placed in certain grades. In other words a detailed discussion of the grades and grading under actual harvesting conditions and with orchard run fruit at hand. After such a meeting outside of the packing house, those present were taken into the packing house where the packing house crews was at work. Here the specialist would take full charge. Starters, runners, feeders, ring tailers, and headers were given instructions in these various operations with special emphasis put on careful handling, packing, etc. This is a splendid way to get the work accross. Growers appreciate the meetings and demonstrations and the helpfulness thoroughly interested. The object is to create a feeling of co-partnership between growers and members of the packing crew.

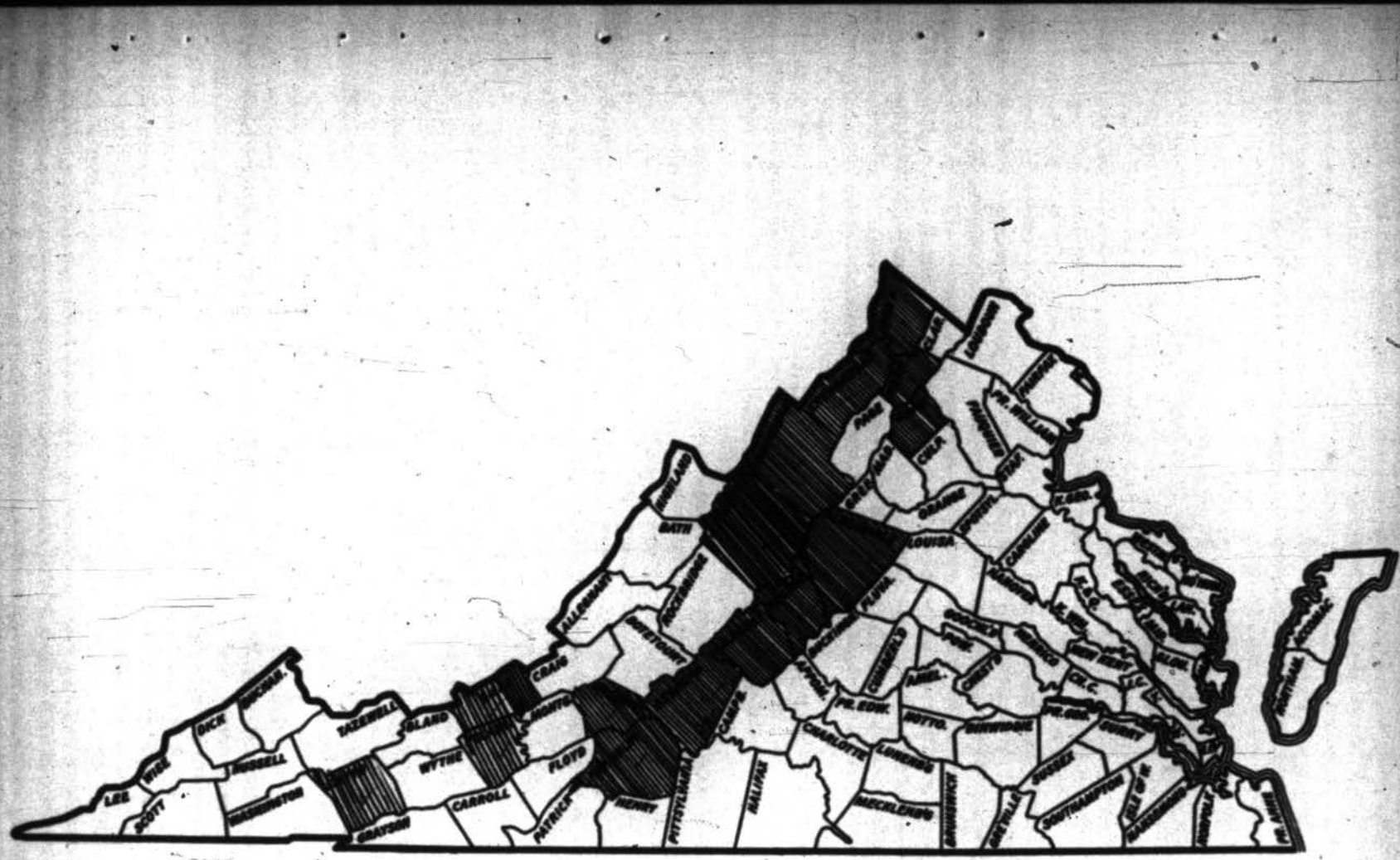
Results

Standardization meetings scheduled	16
Attendance	
Grading and packing demonstrations	39
Attendance	369

Several radio talks were given

Outlook It is felt that some real worth while progress was made this year in standardization work. This project will receive more attention during the coming year. More uniform grading to size and color will be stressed. Slack packs and poor handling effects the condition of the fruit to a marked degree. Every effort will be made to bring this to the attention of the growers.

Packing House Project - A. E. Yoke in Charge This project is carried on in cooperation with the department of Agricultural Engineering. There is a close relation between a standardized pack and packing houses. It is almost impossible to



MEETINGS ON APPLE GRADES AND STANDARDS

Virginia Standards FOR APPLES

Grading, Packing, Inspection AND Rules and Regulations Governing Marking of Containers

Effective August 15, 1931

STATE DEPARTMENT OF AGRICULTURE and IMMIGRATION

G. W. KOINER, Commissioner

See Page 2 for Table of Contents

For Additional Copies of This Booklet Communicate With
J. H. MEEK, Director
DIVISION OF MARKETS
1020 State Office Building
Richmond, Virginia

CONTENTS

I. Virginia Standards for Apples Grade, Size, Packing

In accordance with authority given in chapter 74, Acts of the General Assembly, 1927, page 170, as amended in 1928 and 1930, and after consulting with the officers and directors of the Virginia State Horticultural Society as representing apple growers and shippers of the various sections of the State, official standard grades for apples in closed packages within this State are hereinafter set forth.

(1) VIRGINIA GRADES AND PACKING REQUIREMENTS FOR APPLES PACKED IN ANY RECOGNIZED STANDARD CONTAINER.

(A) Introduction

These grades are the same as the "U. S. Official Standards for the Inspection of Apples," except the grade "Virginia Early Export" is added and the arrangement of order is somewhat different.

Decay, scald or other deterioration which may have developed on apples after they have been in storage or transit shall be considered as affecting condition and not the grade.

Numbers and letters in parentheses following grade terms indicate where such terms are defined on pages 9 to 10, inclusive under Definitions of Terms.

When the numerical count is marked on the container, percentages shall be calculated on the basis of count.

When the minimum diameter or minimum and maximum diameters are marked on the container, percentages shall be calculated on the basis of weight.

When the apples are in bulk, percentages shall be calculated on the basis of weight.

(A-1) Grades

U. S. Fancy shall consist of apples of one variety which are mature (1) but not overripe (2), carefully handpicked (3), clean (4), fairly well formed (5); free from decay, internal browning, internal breakdown, scald, freezing injury, unhealed broken skins, and bruises (except those incident to proper handling and packing), and visible watercore. The apples shall also be **FREE FROM DAMAGE** (7) caused by russeting (7a), sunburn (7b), sprayburn (7b), limbrubs (7c), hail (7d), drought spot (7d), scars (7d), disease (7e), insects (7f), or mechanical or other means (7). Each apple of this grade shall have the amount of color specified hereinafter for the variety. (See requirements for color, page 10; size, page 12; tolerances, page 12.)

U. S. No. 1. The requirements for this grade are the same as U. S. Fancy except that less color is required for all varieties except yellow and green va-

rieties for which the requirements for both grades are the same. Apples of this grade shall be of one variety, mature (1) but not overripe (2), carefully handpicked (3), clean (4), fairly well formed (5); free from decay, internal browning, internal breakdown, scald, freezing injury, unhealed broken skins, and bruises (except those incident to proper handling and packing), and visible watercore. The apples shall also be **FREE FROM DAMAGE** (7) caused by russeting (7a), sunburn (7b), sprayburn (7b), limbrubs (7c), hail (7d), drought spot (7d), scars (7d), disease (7e), insects (7f), or mechanical or other means (7). Each apple of this grade shall have the amount of color specified hereinafter for the variety. (See requirements for color, page 10; size, page 12; tolerances, page 12.)

U. S. Commercial shall consist of apples of one variety which meet the requirements of U. S. No. 1 except as to color. This grade is provided for apples which are mature but which do not have sufficient color to meet the specifications of U. S. No. 1. (See requirements for size, page 12; tolerances, page 12.)

U. S. No. 1 Early shall consist of apples of one variety which meet the requirements of U. S. No. 1 except as to color and maturity. Apples of this grade may have no red color and need not be mature. This grade is provided for early varieties only, such as Oldenburg (Duchess of Oldenburg), Gravenstein, Lowland Raspberry (Liveland Raspberry), Red June, Summer Hagloe, Twenty Ounce, Wealthy, Williams, Bailey Sweet, Bietigheimer and other varieties which ripen at the same period and which are often used for cooking rather than for eating out of hand. (See requirements for size, page 12; tolerances, page 12.)

Virginia Early Export shall consist of apples which meet the requirements of U. S. No. 1, except for color and maturity. (See requirements for size, page 12; tolerances, page 12.)

U. S. Utility shall consist of apples of one variety which are mature (1) but not overripe (2), carefully handpicked (3), not seriously deformed (6); free from decay, internal browning, internal breakdown, scald, freezing injury and unhealed broken skins. The apples shall also be **FREE FROM SERIOUS DAMAGE** (8) caused by dirt or other foreign matter, bruises, russeting (8a), sunburn (8b), sprayburn (8b), limbrubs (8c), hail (8d), drought spot (8d), scars (8d), visible watercore (8e), disease (8f), insects (8g), or mechanical or other means (8). (See requirements for size, page 12; tolerances, page 12.)

U. S. Utility Early shall consist of apples of one variety which meet the requirements of U. S. Utility except as to maturity. Apples of this grade need not be mature. This grade is provided for early varieties only, such as Oldenburg (Duchess of Oldenburg), Gravenstein, Lowland Raspberry (Liveland Raspberry), Red June, Summer Hagloe, Twenty Ounce, Wealthy, Williams, Bailey Sweet, Bietigheimer and other varieties which ripen at the same period and which are often used for cooking rather than for eating out of hand. (See requirements for size, page 12; tolerances, page 12.)

Combination Grades. Combinations of the above grades may also be used as follows:

Combination U. S. Fancy and U. S. No. 1.
Combination U. S. No. 1 and U. S. Commercial.
Combination U. S. No. 1 and U. S. Utility.

Combinations other than these are not provided for in connection with the United States apple grades. When combination grades are packed, at least 50 per cent of the apples in any container shall meet the requirements of the higher grade in the combination. (See requirements for color, page 10; size, page 12; tolerances, page 12.)

U. S. Hail Grade shall consist of apples which meet the requirements of U. S. No. 1 except that hail marks where the skin has not been broken and well healed hail marks where the skin has been broken shall be permitted provided the apples are fairly well formed. (See requirements for color, page 10; size, page 12; tolerances, page 12.)

Unclassified shall consist of apples which are not graded in conformity with any of the foregoing grades. (See size requirements, page 12.)

(B) Virginia Grades for Apples Packed in Any Recognized Container (in Tabulated Form)

Grade U. S. Fancy	One variety mature but not overripe, carefully hand picked.	Fairly well formed, clean.	Free from decay, internal browning, internal breakdown, mold, freezing, injury, unhealed broken skins.	Free from bruises except incident to proper packing, visible watercore.	Free from damage by russeting, sunburn, sprayburn, limbrubs, hail, drought spots, scars, disease, insects, mechanical or other means.	Tolerance 10% total in any container for defects, 5% for serious damage by insects, 1% for decay or internal breakdown.	Tolerance for size, 5% except when maximum and minimum sizes specified an additional 10% is permitted for apples exceeding maximum size.	Tolerance for packing, 5% of the containers may be below requirements.	See color requirements in grades.
U. S. No. 1 (Same as U. S. Fancy except for color on red variation.)	As above.	As above.	As above.	As above.	As above.	As above.	As above.	As above.	See color requirements in grades.
U. S. Commercial (Same as U. S. No. 1 except as to color.)	As above.	As above.	As above.	As above.	As above.	As above.	As above.	As above.	No color requirements.
U. S. No. 1 Early (Same as U. S. No. 1 except as to color and maturity.)	As above except apples need not be mature.	As above.	As above.	As above.	As above.	As above.	As above.	As above.	No color requirements.

U. S. Utility.	One variety mature but not overripe, carefully hand picked.	Not seriously deformed, free from serious damage by dirt or other foreign matter.	As above.	Free from serious damage by broken, visible watercore.	Free from serious damage by above.	As above.	As above.	As above.	No color requirements.
U. S. Utility Early (Same as U. S. Utility except as to maturity.)	As above except apples need not be mature.	As above.	As above.	As above.	As above.	As above.	As above.	As above.	No color requirements.
Combination Grades	Combinations as follows may be packed: "Combination U. S. Fancy and U. S. No. 1." "Combination U. S. No. 1 and U. S. Commercial." "Combination U. S. No. 1 and U. S. Utility." At least 50% of the apples in any container shall meet the requirements of the higher grade in the combination.					As above but no part of any tolerance shall be used to reduce the percentage of apples of the higher grade in the combination.	As above.	As above.	See color requirements in grades.
U. S. Hail Grade	Apples of this grade shall meet the requirements of U. S. No. 1 except that hail marks where the skin has not been broken and well healed hail marks where the skin has been broken shall be permitted provided the apples are fairly well formed.					10% total in any container for defects, 5% for serious damage by insects, 1% for decay or internal breakdown.	As above.	As above.	See color requirements in grades.
Virginia Early Export	Same as requirements for U. S. No. 1, except for color and maturity.								

Unbottled shall consist of apples which are not graded in conformity with any of the foregoing grades.
(For further information on defects not tabulated above which may or may not be permitted in the various grades consult an official inspector.)

(Special attention is called to the importance of a clear understanding of the definitions below for Number 7—DAMAGE, Number 8—SERIOUS DAMAGE, and the way these words with their definitions apply to the different grades.)

(C) Definitions of Terms

As used in these grades:

1. "Mature" means having reached the stage of maturity which will insure the proper completion of the ripening process.

Before a mature apple becomes overripe it will show varying degrees of firmness depending upon the stage of the ripening process. The following terms are used for describing these different stages of maturity of apples:

"Hard" means apples with tenacious flesh and starchy flavor. Apples at this stage are suitable for storage and long-distance shipment.

"Firm" means apples with tenacious flesh but becoming crisp with a slight starchy flavor except the Delicious variety. Apples at this stage are also suitable for storage and long-distance shipment.

"Firm ripe" means with crisp flesh except that in apples of the Gano, Ben Davis and Rome Beauty varieties, the flesh may be slightly mealy. Apples at this stage may be shipped long distances but should be moved into consumption within a short period of time.

"Ripe" means mealy and soon to become soft for the variety. Apples at this stage should be moved immediately into consumption.

2. "Overripe" means dead ripe, very mealy or soft, past commercial utility.

3. "Carefully handpicked" means that the apples do not show evidence of rough handling or of having been on the ground.

4. "Clean" means free from excessive dirt, dust, spray residue or other foreign material.

5. "Fairly well formed" means that the apples may be slightly abnormal in shape but not to an extent which detracts materially from the appearance of the fruit.

6. "Seriously deformed" means so badly misshapen that the appearance is severely affected.

7. "DAMAGE" means any injury or defect which materially detracts from the appearance or keeping quality of the apples.

(a) Russeting which exceeds the following shall be considered as damage:

Russeting which is excessively rough on Roxbury Russet and other similar varieties.

Russeting on other varieties which covers a total area of more than 25 per cent of the surface in the aggregate except that—

(1) Smooth solid russeting which covers an area of more than 10 per cent of the surface in the aggregate shall be considered as damage unless the russeting is within or continuous with that in the stem basin or calyx cavity, in which case an additional 15 per cent shall be permit-

ted provided that the total area covered shall not exceed 25 per cent in the aggregate.

(2) Slightly rough russeting which covers an area of more than 15 per cent of the surface if confined to the stem basin or calyx cavity or continuous therewith, or such russeting which covers an area of more than one-half inch in diameter if it is not continuous with the russeting in the stem basin or calyx cavity, shall be considered as damage.

(3) Rough russeting which is well within the stem basin and is not readily apparent shall be permitted but any other rough russeting which exceeds one-quarter inch in diameter shall be considered as "damage".

Any one of the **following** defects, or any combination thereof, the seriousness of which exceeds the maximum allowed for any one defect, shall be considered as damage:

(b) **Sunburn** or **sprayburn** which has caused blistering or cracking of the skin or when the discolored area does not blend into the normal color of the fruit unless the injury can be classed as russeting (7a).

(c) Dark brown or black **limbrubs** which affect a total area of more than one-half inch in diameter or light brown **limbrubs** which affect a total area of more than one inch in diameter.

(d) **Hail marks**, drought spots or other similar depressions or scars which are not superficial or where the injury affects more than one-half inch of the surface in the aggregate.

(e) **Disease. Scab spots** which are not corked over or corked-over scab spots which affect a total area of more than one-fourth inch in diameter.

Cedar-rust infection which exceeds in the aggregate an area of one-quarter inch in diameter.

Sooty blotch or **fly speck** which is thinly scattered over more than one-tenth of the surface, or dark, heavily concentrated spots which affect an area of more than one-half inch in diameter.

(f) **Insects.** More than two healed insect stings or any healed insect sting which is over one-eighth inch in diameter exclusive of any encircling discolored ring.

Worm holes.

8. **"SERIOUS DAMAGE"** means any injury or defect which seriously detracts from the appearance or keeping quality of the apples.

(a) **Russeting** which exceeds the following shall be considered as serious damage:

Smooth solid russeting which affects more than one-half of the surface in the aggregate, including any russeting in the stem basin, or rough or bark-like russeting which detracts from the appearance of the fruit to a greater extent than the smooth solid russeting permitted provided that any amount of russeting shall be permitted on Roxbury Russet and similar varieties.

Any one of the **following** defects or any combination thereof, the seriousness of which exceeds the maximum allowed for any one defect shall be considered as serious damage:

(b) **Sunburn** or **sprayburn** which seriously detracts from the appearance of the fruit.

(c) **Limbrubs** which affect more than one-tenth of the surface in the aggregate.

(d) **Hail marks**, drought spots or scars if they materially deform or disfigure the fruit or if such defects affect more than one-tenth of the surface in the aggregate, provided that no hail marks which are unhealed shall be permitted and not more than an aggregate area of one-half inch shall be allowed for well healed hail marks where the skin has been broken.

(e) Visible **watercore** which affects an area of more than one-half inch in diameter.

(f) **Disease.**

Scab spots which are not corked over or corked-over scab spots which affect a total area of more than three-fourths inch in diameter.

Cedar-rust infection which exceeds in the aggregate an area of three-fourths inch in diameter.

Sooty blotch or fly speck which affects more than one-third of the surface.

(g) **Insects.**

More than five healed insect stings.

Worm holes.

(For further information on defects not defined above which may not be permitted in the various grades consult an official inspector.)

A spot one-eighth inch in diameter is herewith illustrated.

A spot one-fourth inch in diameter is herewith illustrated.

A spot one-half inch in diameter is herewith illustrated.

(D) Color Requirements

In addition to the foregoing requirements for U. S. Fancy and U. S. No. 1, each apple of these grades must have the percentage of color shown in the table below.

For the solid red varieties the percentage stated refers to the area of the surface which must be covered with a good shade of solid red characteristic of the variety, except that an apple having color of a lighter shade of solid red or striped red than that considered as good shade of red characteristic of the variety may be admitted to a grade provided it has sufficient additional area covered so that the apple has as good an appearance as one with the minimum percentage of good red characteristic of the variety required for the grade.

For the striped red varieties the percentage stated refers to the area of the surface in which the stripes of good shade of red characteristic of the variety

shall predominate over the stripes of lighter red, green or yellow. However, an apple having color of a lighter shade than that considered as good shade of red characteristic of the variety may be admitted to a grade provided it has sufficient additional area covered so that the apple has as good an appearance as one with the minimum percentage of stripes of good red characteristic of the variety required for the grade. Faded brown stripes shall not be considered as color except in the case of the Gray Baldwin variety.

VARIETY	U. S. FANCY Per cent	U. S. No. 1 Per cent
Solid red:		
Allen Red	10	25
Arkansas Black	10	25
Black Ben	10	25
Detroit Red	10	25
Esopus Spitzenburg	10	25
Gano	10	25
King David	10	25
Lawry	10	25
Opalescent	10	25
Virginia Beauty	10	25
Winesap	10	25
Other similar varieties	10	25
Striped or partially red:		
Jonathan	10	25
Kinnard	10	25
McIntosh	10	25
Missouri Pippin	10	25
Other similar varieties	10	25
Arkansas (Mammoth Black Twig)	25	15
Delicious	25	15
Baldwin	25	15
Gray Baldwin	25	15
Ben Davis	25	15
Boston	25	15
Fameuse	25	15
Limbertwig	25	15
Nero	25	15
Northern Spy	25	15
Ontario	25	15
Paragon	25	15
Ralls (Genetton)	25	15
Rainier	25	15
Rome Beauty	25	15
Salome	25	15
Stayman Winesap	25	15
Sutton	25	15
Tompkins King	25	15
Wagener	25	15
Wealthy	25	15
Willowtwig	25	15
York Imperial	25	15
Other similar varieties	25	15
Stark	25	10
Hubbardston	25	10
Other similar varieties	25	10
Red June	25	Tinge of color
Williams	25	- - -
Other similar varieties	25	- - -
Gravenstein	25	- - -
Jeffries	25	- - -
Oldenburg (Duchess of Oldenburg)	25	- - -
Red Astrachan	25	- - -
Shiawassee	25	- - -
Smokehouse	25	- - -
Summer Rambo	25	- - -
Twenty Ounce	25	- - -
Other similar varieties	25	- - -
Red cheeked or blushed:		
Hyde King	(1)	None
Maiden Blush	(1)	-
Monmouth (Red Cheeked Pippin)	(1)	-
Winter Banana	(1)	-
Other red cheeked or blushed varieties	(1)	-
Yellow or green varieties	(2)	(2)

(1) Blushed cheek. (2) Characteristic color.

(E) Size Requirements

The numerical count, or the minimum size, of the apples packed in a closed container shall be indicated on the package.

When the numerical count is marked on the container the apples shall not vary more than one-fourth inch in their transverse diameter.

When the numerical count is not shown the minimum size shall be plainly stamped, stenciled or otherwise marked on the container in terms of whole inches, whole and half inches, whole and quarter inches, or whole and eighth inches, as 2½ inches minimum, 2¼ inches minimum, or 2⅛ inches minimum, in accordance with the facts. It is suggested that both minimum and maximum sizes be marked on the container, as 2¼ to 2¾ inches or 2½ to 2¾ inches, as such marking is especially desirable for apples marketed in the export trade.

"Size" means the transverse diameter of the apple taken at right angles to a line running from the stem to the blossom end.

In order to allow for variations incident to proper sizing, not more than 5 per cent of the apples in any container may not meet the size requirements, provided that when the maximum and minimum sizes are both stated an additional 10 per cent tolerance is provided for apples which are larger than the maximum size stated.

(F) Tolerances for Preceding Grades

In order to allow for variations incident to proper grading and handling, not more than a total of 10 per cent of the apples in any container may be below the requirements of the grade, provided that not more than 5 per cent shall be seriously damaged by insects and not more than one-fifth of this amount, or 1 per cent, shall be allowed for decay or internal breakdown.

When applying the foregoing tolerances to the combination grades no part of any tolerance shall be used to reduce the percentage of apples of the higher grade required in the combination.

The tolerances specified for the various grades are placed on a container basis. However, any lot of apples shall be considered as meeting the requirements of a specified grade if the entire lot averages within the tolerances specified, provided that no sample from the containers in any lot is found to exceed the following amounts:

For a specified tolerance of 10 per cent, not more than one and one-half times the tolerance shall be allowed in any one package.

For specified tolerances of 5 per cent or less, not more than double the tolerance shall be allowed in any one package.

(G) Condition After Storage or Transit

Decay, scald or other deterioration which may have developed on apples after they have been in storage or transit shall be considered as affecting condition and not the grade.

(H) Packing Requirements

Each package shall be packed so that the apples in the shown face shall be reasonably representative in size, color and quality of the contents of the package.

Boxes—Apples packed in the Standard Northwestern apple boxes shall be arranged in the containers according to the approved and recognized methods with the stems pointing towards the ends of the boxes except when jumbled and all packages shall be well filled but the contents shall not show excessive or unnecessary bruising because of overfilled packages. Apples packed in the Standard Northwestern apple boxes shall show a total bulge (top and bottom) of not less than three-fourths inch. Each wrapped apple shall be completely enclosed by its individual wrapper.

Baskets—Apples packed in round stave bushel baskets or tubs shall be ring faced and tightly packed with sufficient bulge to prevent any appreciable movement of the apples within the containers when lidded.

Barrels—Apples in barrels shall be tightly packed.

In order to allow for variations incident to proper packing not more than 5 per cent of the containers in any lot may not meet these requirements.

(I) Marking Requirements

In order to conserve space, abbreviations may be used for marking the United States grade names on containers. The following abbreviations are suggested where it is not desired to use the full grade name:

1. U. S. Fcy. for U. S. Fancy.
2. U. S. No. 1 for U. S. Number 1.
3. U. S. Com. for U. S. Commercial.
4. U. S. Util. for U. S. Utility.
5. Combination grades may be designated by abbreviations of the grades preceded by the abbreviation "Comb." as "Comb. U. S. Fcy. —U. S. No. 1".

(2) U. S. STANDARDS FOR EXPORT

(As applied to condition factors)

1. The apples in any lot shall be generally tightly packed when in barrels or baskets and either generally fairly tight or tightly packed when in boxes.

2. Not more than 5 per cent of the apples in any container shall be further advanced in maturity than firm ripe.

3. Not more than a total of 5 per cent of the apples in any container shall be damaged by bitter pit, Jonathan Spot, scald, internal breakdown, watercore, freezing, decay, or other condition factors, except that—

(a) Not more than 2 per cent shall be allowed for apples affected by decay.
(b) Not more than 2 per cent shall be allowed for damage by internal breakdown.
(c) The apples shall be free from scald unless they are properly packed in oiled paper or have been especially treated with oil to prevent scald.

When so packed or treated not more than 2 per cent of slight scald shall be permitted.

Any lot of apples shall be considered as meeting the standards for export if the entire lot averages within the requirements specified, provided that no sample from the containers in any lot is found to exceed double the percentages specified.

(3) VIRGINIA GRADES AND PACKING REQUIREMENTS FOR APPLES PACKED IN RECOGNIZED STANDARD BOXES AND OTHER RECOGNIZED STANDARD CONTAINERS WHEN SIZED TO ONE-QUARTER OR ONE-HALF INCH VARIATIONS.

(A) Introduction

These grades are the same as those used in the State of Washington. They are for use by those who prefer them to the U. S. Grades for packing in the recognized standard apple box and other recognized standard containers apples sized to one-quarter (¼) inch or one-half (½) inch variations.

(A-1) Grades

Extra Fancy shall consist of apples of one variety which are mature, hand picked, clean, well formed, sound; free from bruises, limb-rubs, sprayburn, sunburn, russeting, drought spot, hail mark, visible watercore, broken skin, apple scab, stings, and from diseases and insect injury, except that **SLIGHT BLEMISHES** shall be permitted in this grade.

Each apple shall have the amount of color hereinafter specified for apples in this grade.

Fancy shall consist of apples of one variety which are mature, hand picked, clean, fairly well formed, sound; free from visible watercore, broken skin, and from **DAMAGE** caused by bruises, limbrub, sprayburn, sunburn, russeting, drought spot, hail marks, apple scab, disease and insect injury.

Each apple shall have the amount of color hereinafter specified for apples in this grade.

C Grade shall consist of apples of one variety which are mature, hand picked, clean, not badly misshapen, sound; free from soft bruises, broken skin, and from **SERIOUS DAMAGE** caused by sunburn, growth cracks, visible watercore, disease and insect injury.

Each apple shall have the amount of color hereinafter specified in this grade.

Combination Grades. When Extra Fancy and Fancy apples are packed together, the boxes may be marked "Combination Extra Fancy and Fancy Grade"; and when Fancy and "C" Grade apples are packed together, the boxes may be marked "Combination Fancy and 'C' Grade"; and when Extra Fancy and "C" Grade apples are packed together the boxes may be marked "Combination Extra Fancy and 'C' Grade"; but Combination Grades must contain at

least 25 per cent of apples which would be permitted in the higher grade.

When Extra Fancy, Fancy and "C" Grade apples are packed together, the boxes must be marked "Orchard Run" or "Combination Extra Fancy, Fancy, and 'C' Grade", and must contain at least 25 per cent Extra Fancy apples. It shall be unlawful to remove any of the higher grade apples and then pack the remainder as "Orchard Run" or "Combination Extra Fancy, Fancy and 'C' Grade" except that the larger sizes of all grades may be removed and the rest boxed and marked "Jumble" or "Face and Fill" in addition to the Grade mark.

Hail Grade. The qualifications for this grade shall be the same as for Combination Extra Fancy and Fancy Grade, except that thoroughly healed hail marks and those of fresh hail marks which do not cut the skin will be allowed. All other hail injured apples that meet the specifications of "C" Grade shall be put up as "C" Grade. The marks or labels "Extra Fancy" or "Fancy" shall not appear on the boxes.

Note—

Summer and Early Fall Varieties. Summer varieties such as Yellow Transparent, Duchess, Early Harvest, Red June and kindred varieties not otherwise specified in these grading rules, together with early fall varieties such as Wolf River, Wealthy, Grimes, Rambo, Bonum, Greening, Jonathan, King David and other similar maturing varieties, may be packed and marked in accordance with the foregoing rules.

Unclassified shall consist of apples which are not graded in conformity with any of the foregoing grades. (See size requirements, page 19.)

(B) Definitions of Terms

"Mature" means having reached the stage of maturity which will insure a proper completion of the ripening process. Firmness of flesh shall be considered only in connection with other factors to determine the degree of maturity.

"Hand Picked." Apples shall be considered hand picked unless they show evidence of rough handling or of having been on the ground.

"Clean" means reasonably free from dust, dirt, or honey dew.

"Well formed" means having the normal shape characteristic of the variety, except that the shape may be slightly irregular provided it does not detract from the general appearance of the apple.

"Fairly well formed" means the apples shall meet the requirements of "Well formed" in the Extra Fancy grade except that one-half of the apple may deviate slightly from that definition, or the apple may be slightly flattened as by frost injury.

"Not badly misshapen" means that an apple may be more irregularly shaped than "Fairly well formed" as defined in the Fancy Grade, but shall not be deformed to the extent of materially affecting its culinary value or its general appearance.

"Sound" means apples that at time of packing are free from visible defects such as decay, breakdown, scald, bitter pit, or physical injury affecting keeping quality.

"Aggregate area" means that all the areas of the

blemish under consideration may be assembled into one circular area of the maximum diameter specified.

"SLIGHT BLEMISHES" means (a) Slight handling bruises and box bruises such as are incident to good commercial handling in the preparation of a tight pack.

(b) Russeting. Smooth russeting shall be permitted at the stem end provided such russeting is not visible for more than one-half inch when the apple is placed stem end down on a flat surface, except in the Newtown variety characteristic russet commencing at the stem end shall be permitted as long as it is continuous from the stem bowl and not extending beyond the center of the apple.

(c) Smooth netlike russeting which does not extend over an aggregate area of more than 5 per cent of the surface of the apple, except on Rome Beauty light netlike russeting on the color portion of the apple which does not materially detract from its appearance shall be permitted.

(d) Sunburn when slight and when the normal color of the apple is but slightly changed and the affected area does not exceed 5 per cent of the surface of the apple.

(e) Smooth solid russeting, light limbrubs, hail mark or sprayburn of a russet character shall be permitted when the aggregate area affected does not exceed one-quarter inch.

(f) Slight hail marks or other depressions when there is no discoloration, when the indentations are very shallow, and no individual indentation exceeds one-eighth inch in diameter, and the aggregate area affected does not exceed one-quarter inch.

(g) Thrip marks not to exceed three in number shall be permitted.

"DAMAGE". The following shall not be considered as damage:

(a) Slight handling bruises and box bruises such as are incident to good commercial handling in the preparation of a tight pack.

(b) Russeting. Smooth russeting shall be permitted at the stem or calyx end provided such russeting is not visible for more than one-half inch when the apple is placed with the russet end down on a flat surface, except in the Newtown variety characteristic russet commencing at the stem or calyx end and not extending beyond the center of the apple shall be permitted as long as it is continuous from the stem or calyx bowl.

(c) Two stings, each having an encircling hard ring, usually green, or a slight depression, provided stings do not exceed one-eighth inch in diameter exclusive of any encircling ring.

(d) Smooth netlike russeting which does not extend over an aggregate area of more than 20 per cent of the surface except on Rome Beauty netlike russeting on the colored portion of the apple which does not materially detract from its appearance shall not be counted in computing the 20 per cent area mentioned above.

(e) Sunburn, when the normal color of the apple is not seriously affected, there is no blistering or cracking of the skin, and the discolored area blends into the normal color of the fruit.

(f) Sprayburn, which has altered or discolored natural pigment when the normal color of the apple

is not seriously affected, when there is no blistering or cracking of the skin, except that red spot such as caused by Bordeaux shall not extend over more than 20 per cent of the apple.

(g) Slight aphis signs or thrip marks which do not roughen or pebble the surface of the apple.

In addition to the above, an apple may show any one or a combination of the following, the aggregate of which does not exceed one-half of an inch:

(h) Apple scab spots affecting a total area of not more than one-quarter inch in diameter.

(i) Hail marks, drought spots, or other depressions when the injury is slight, the skin is not broken and the depressions do not exceed an aggregate area of one-half inch in diameter or detract seriously from the appearance of the fruit. Hail injury of a russet character shall be governed by the definition covering russet injury.

(j) Solid russeting such as is characteristic of frost, sprayburn, hail, and certain insect and disease injury affecting a total aggregate area of not to exceed one-half inch. Sprayburn of a russet nature shall be governed by the definition covering solid russeting.

(k) Limbrub not to exceed one-half inch in aggregate area.

"Serious damage" means any injury or defect which seriously detracts from the appearance or keeping quality of the apple. The following defects shall not be considered as serious damage:

(a) Scab spots affecting an aggregate area of not to exceed one-half inch in diameter.

(b) Five stings each having an encircling hard ring, usually green, or a slight depression, provided stings do not exceed one-eighth of an inch in diameter exclusive of any encircling ring.

(c) Heavy russeting which does not exceed more than one-fourth of the surface.

(d) Visible watercore which does not affect an area of more than one-half inch in diameter.

(e) Aphis pebbling or thrip marks not seriously detracting from appearance of the apple.

(f) Slightly larger handling and box bruises than specified in Fancy but not soft bruises.

(g) Growth cracks such as occur in Staymans shall be permitted when no crack exceeds three-quarters inch in length.

(h) Hail marks, drought spots or other depressions, when the injury is slight, the skin is not broken and the depressions do not exceed an aggregate area of three-quarters inch in diameter.

(C) Color Requirements

Apples shall be admitted to the grades subject to the following color specifications:

Red Varieties.

The percentage of color in the following table refers to the aggregate color areas of the surface which must be covered with a good shade or shades of red characteristic of the variety.

	EXTRA FANCY	FANCY	"C" GRADE
Aiken Red	75%	33%	Some Color
Arkansas Black	75%	33%	Some Color
Baldwin	75%	33%	Some Color
Black Ben Davis	75%	33%	Some Color
Detroit Red	75%	33%	Some Color
Gano	75%	33%	Some Color
Spitzenburg (Esopus)	75%	33%	Some Color
Winesap	75%	33%	Some Color
Red Sport Varieties*	75%	33%	Some Color
King David	65%	33%	Some Color

*When sport varieties are marked as such, they shall meet the color requirements of red sport varieties, and the boxes must also bear the name of the parent variety.

Partial Red Varieties.

The percentage of color in the following table shall be the specified percentage of area in which the good red shades, or stripes, shall be in excess of the shades of thin red, green, or yellow.

	EXTRA FANCY	FANCY	"C" GRADE
Delicious	65%	25%	Some Color
Stayman Winesap	65%	25%	Some Color
Spitzenburg (Esopus)	65%	25%	Some Color
Jonathan	65%	25%	0
Vanderpool	65%	25%	0
Black Twig	65%	25%	0
Ben Davis	50%	15%	0
Paneuse	50%	15%	0
Ganfum	50%	15%	0
McIntosh Red	50%	15%	0
Missouri (Pippin)	50%	15%	0
Northern Spy	50%	15%	0
Rainier	50%	15%	0
Rome*	50%	15%	0
Wagner	50%	15%	0
Wealthy	50%	15%	0
York Imperial	50%	15%	0

*No color requirements for Fancy Rome, 100s and larger.

Red Cheeked or Blushed Varieties.

	EXTRA FANCY	FANCY	"C" GRADE
Maiden Blush	Some Color	0	0
Red Cheek Pippin	Some Color	0	0
Winter Banana	Some Color	0	0

Green or Yellow Varieties.

	75%		
Golden Delicious	Yellow Color	0	0

In the following, no color required in Extra Fancy, Fancy or "C" Grade; natural blush not objectionable:

Albemarle Pippins
Alexander
Bailey Sweet
Bietigheimer
Cox's Orange (Pippin)
Dutchess
Fall Pippin
Gravenstein
Jeffries
King
Red Astrachan
Red June
Twenty Ounce
Wolf River
Early Harvest
Grimes (Golden)
Ortley
Rhode Island (Greening)
Tolman
White Winter Pearmain
Yellow Bellefleur
Yellow Newtown
Yellow Transparent

(D) Box Packs

All apples meeting hail grade, "C" or third grade, or better, packed under these regulations, shall be

arranged in clean, fairly bright, and tightly nailed boxes and according to the approved and recognized methods with the stems pointing towards the ends of the box, except when jumbled, and all boxes shall be tightly packed at time of packing, but the contents shall not show excessive or unnecessary bruising because of an over-filled package. Each apple wrapped shall be well wrapped.

(E) Sizes

The following packs shall be recognized as standard for determining range in sizes: 36, 48, 56, 64, 72, 80, 88, 96-100, 113, 125, 138, 150, 162-163, 175-180, 198-200, 216, 234, 252. (Note: Where two figures are joined by a hyphen they stand for one size.)

The following terms will be used for description of degrees of uniformity of sizing of apples in packed boxes:

Uniform when the box contains not more than two sizes, the majority of which must be of the size with which the box is marked;

Fairly uniform when the box actually contains a range of not more than three sizes, one size larger and one size smaller than the size with which the box is marked;

Slightly irregular when not more than 10% of the apples in the box exceed the range of three sizes mentioned above;

Irregular when more than 10% of the apples in the box exceed the range of three sizes mentioned above.

(F) Tolerances Which Apply at Time of Packing.

In order to allow for variations incident to commercial grading and handling, in each of the foregoing grades not more than 10% by count, of any lot may be below the requirements of the grade and not more than one-tenth (1/10) of this amount shall be allowed for decay and/or breakdown. Slight imperfections which are not discernible in good commercial sorting practice shall not be considered defects of grade.

In addition to the above, a 10% tolerance for a total of all defects from the standards defined for uniformity of size, wrapping, and tightness of pack will be permitted in any lot and shall be computed by counting, weighing, or measuring the specimens judged to be below the standard.

In "C" Grade, punctured apples in which no one puncture shall exceed 3/16 of an inch shall be scored as one-half of a point of variation.

(G) Tolerances Which Apply After Apples Have Been in Storage or in Transit.

After fruit has been placed in storage or in transit, scald, breakdown, decay, bitter pit, or physical injury affecting keeping quality which may have developed or may only have become evident after apples are packed are defined as applying to condition rather than to grade.

II. Rules and Regulations Governing the Marking of Packages

In accordance with authority given by chapter 74, Acts of the General Assembly, 1927, page 170, as amended in 1928 and 1930, the following Rules and Regulations governing the marking of closed packages of apples are hereby prescribed and promulgated.

(1) PACKAGE MARKING REQUIREMENTS

Every closed package containing apples grown and packed in the State of Virginia and sold, offered or exposed for sale, or packed or repacked for sale or transported for sale by any person, firm, company or organization, shall bear **conspicuously** upon the outside thereof, in **plain words and figures**, the following:

(A) Variety.
(B) Minimum size.
(C) Grade.
(D) Name and address.
(E) Size of container or quantity of apples.

(A) **VARIETY** means the true name of the variety of apples in the container. If the name of the variety is not known to the party or parties responsible for the packing, the package must be marked "Variety Unknown" or "Var. Unknown."

(B) **MINIMUM SIZE.** (See size requirements on pages 12, 19.) The words minimum, maximum and inches may be abbreviated as "Min.", "Max." and "In." If words indicating minimum are not used on the package, it shall be understood that the figures placed upon the package shall represent the minimum size of the apples therein contained, unless figures representing both minimum and maximum size are used, as "Size 2½ to 3 in." The words "Up" and "And up" are recognized as indicating minimum, but they are also understood to mean that none of the large apples have been sorted out in grading and packing, and they shall not be used in size markings where any of the larger apples have been removed. (It is recommended that where apples are sized to quarter or half inch diameters the markings indicate this fact, as "2¼ to 2½ in."

(C) **GRADE** means the name of the grade as set forth in the Virginia Standards for Apples. Only one grade designation shall appear on any package. No other name, word or description implying grade or quality shall appear in addition. (For abbreviations see marking requirements paragraphs on pages 13 and 22.)

(D) **NAME AND ADDRESS** means the initials or given name and surname of the person or the name of the firm, corporation or association responsible for the grading, packing and marking, and the postoffice or business address of such person, firm, corporation, or association. **("U. S. A." should be added on apples exported to Great Britain to comply with the requirements of that country.)** When apples are repacked and/or remarked the person, firm, cor-

poration, or association by whose authority the repacking or remarking is done shall cancel the name and address of the original packer and substitute therefor his or its own name and address, and he or it thereby assumes responsibility for the markings. If the name of any other person, firm, corporation or association is marked on any package or packages instead of, or in addition to the original name, he or it shall assume all responsibility for the packing and/or markings of such package or packages.

If any of the original markings of a package or packages are changed as to size or to indicate a higher grade than the first markings by any other than the person, firm, corporation or association who originally packed and/or marked them, or his or its representative, the person, firm, corporation or association changing the marking shall assume all responsibility and mark such package or packages with the name and address of the person, firm, corporation or association responsible for such changes, and remove, obliterate or cover over the name of the person who originally packed and/or marked them.

(E) **SIZE OF CONTAINER OR QUANTITY OF APPLES** means that the package must be marked "U. S. Standard Barrel," "U. S. Standard Bushel," or "Net Weight When Packed —— Pounds," in accordance with the facts. These terms may be abbreviated as follows: "U. S. Std. Bbl." "U. S. Std. Bu." or "Net Wt. When Pkd. —— Lbs."

Apples properly packed in the standard apple box, and other containers when sized to one-quarter (¼) or one-half (½) inch variations, may be marked to show the number or count. When the word "Apples" does not appear on the label or otherwise prominently, the word "Apples" must accompany the number or count thus—"125 Apples."

(In order to comply with the Weights and Measures Law of Virginia the containers must be properly filled. Barrels, baskets and boxes of apples are properly filled when the apples are tight or fairly tight within the package. It should not be inferred that a fairly tight pack is a perfect pack, nor does a fairly tight pack meet the U. S. Export Standards for apples packed in barrels and baskets.)

(F) **LOCATION OF MARKINGS.** All markings required by these regulations must be placed on one end of the barrel or box and on the cover of the basket, except that the marking "U. S. 1 Bu." on the side of baskets will be recognized and labels containing any of the required marks may be placed upon sides of baskets and the same need not appear on the cover. If apples are packed in closed sacks, or any other closed container each package must be either branded or otherwise marked with the required markings or must have attached thereto a label showing the proper markings as herein described.

(G) **SIZE OF LETTERS AND FIGURES.** Markings on containers shall be in plain and conspicuous words and figures. They shall be stenciled, stamped or printed in well proportioned letters and figures of a size not less than one-half (½) inch in height for barrels or three-eighths (⅜) inch in height for boxes, baskets and other containers.

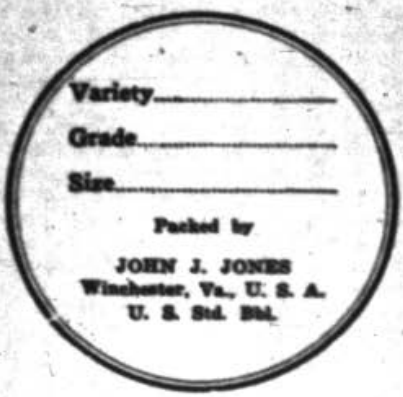
(H) **RECOGNIZED STANDARD CONTAINERS.** The U. S. standard barrel, basket with con-

tents of one (1) or of one-half (½) U. S. standard bushel, and boxes with dimensions of the standard Northwest apple box are recognized standard containers. Other boxes or cartons with contents of one (1) or one-half (½) U. S. standard bushel when dimensions are approved may be recognized as standard containers. No other containers will be considered as standard unless the contents and dimensions are approved.

(2) MARKING FOR EXPORT TO GREAT BRITAIN

American apples arriving in the United Kingdom, in order to comply with requirements as to specific mark of origin, must be marked indelibly and in a conspicuous manner as follows: "By means of printing, stenciling, stamping or branding on each outer container, or on a label securely attached thereto, in letters not less than one-half inch in height," with the following: **"Produce of U. S. A."** or the name and address of the packer and shipper together with the abbreviation **U. S. A.** The word "America" or the phrase "American Produce" will not be acceptable to the British authorities.

(3) SUGGESTIONS FOR PROPER MARKING OF PACKAGES



Suggested stenciling or stamping for a barrel.

It is important that the variety, grade and size designations be so grouped, located and legibly placed upon the barrel as to make instant reading of them possible in the dim light of warehouses and cold storages. Barrel stencils may be constructed with removable grade, variety and size terms.

Suggested marking for a barrel label.

FANCY 125

WINESAP

(LABEL)

Packed by
JOHN DOE, Crozet, Virginia
U. S. A.

U. S. STANDARD BUSHEL

Suggested marking for an apple box.

Suggested marking for a bushel basket cover.

III. Voluntary Inspection Services on Apples Available in Virginia Through the Division of Markets

(1) GENERAL STATEMENT

Voluntary inspection should not be confused with the regulatory inspection which is carried on by representatives of the Division of Markets under the act of the Virginia Assembly of 1927, as amended in 1928 and 1930 and printed in this booklet. If the same person who inspects for the purpose of issuing a Federal-State or a State certificate or who does Virginia ring inspection also condemns apples because of mismarking, it should be remembered that in the latter capacity he is acting solely by virtue of his police authority. This is in addition to his authority to act as a representative of the inspection service of the Division of Markets or of the U. S. Department of Agriculture.

(2) FEDERAL-STATE CERTIFICATE INSPECTION

This type of inspection which is being used by growers and shippers in all parts of the United States at shipping points is undoubtedly the most valuable inspection service offered. The certificates issued are used in selling and in settling of claims, and serve as a common language between financially interested parties. The shipping point inspection service is carried on by the U. S. Department of Agriculture in cooperation with the various States. Certificates cover specified lots, such certificates issued in this State being prima facie evidence in all courts of the United States and of Virginia. This same type of inspection service at receiving points is maintained and operated entirely by the U. S. Department of Agriculture.

(3) VIRGINIA STATE RING INSPECTION

The Virginia State Division of Markets has maintained a type of inspection at packing houses where requested, known as Ring Inspection. This type of inspection derives its name from the fact that several growers in one locality are visited each day by the inspector at their packing houses where daily inspections are made and a State stamp used on the barrels to indicate that they have been packed under State supervision. This State ring inspection stamp has but little value in interstate commerce, and as the growers are becoming more proficient in putting up good packs this type of inspection is giving way to Federal-State inspection.

(4) STATE CERTIFICATE INSPECTION

For the purpose of meeting the quarantine requirements of other States and foreign countries against products being shipped from Virginia, the Virginia Division of Markets has issued State certificates covering such items as San Jose scale on apples and potato wart on potatoes. An occasional straight State certificate for grade, quality and condition is issued when conditions justify it.

IV. Important Information

(1) USE OF SHREDDED OILED PAPER

For successful scald control every apple should have some contact with the paper. Mats of paper give a temporary bridging effect and result in the barrel becoming slack. Not less than 1½ pounds of paper should be used to the barrel. The paper should carry at least 15 per cent of its weight in oil and 18 per cent is more desirable. A paper that is resilient and springy is better than one that is soft and inclined to mat. Strips about five inches long and three-eighths inch wide have met with rather general approval among users. Paraffin paper does not give satisfactory control of scald.

(2) RECOGNIZED STANDARD APPLE BOX

The standard size of an apple box is 18 inches long, 11⅝ inches wide, 10½ inches deep, inside measurements.

Ends—⅞ or ¾x10½x11⅝, 2 pieces, 20 to the bundle.

Sides—¾x10½x19½ or 19¾, 2 pieces, 40 to the bundle.

Top and bottom—¼x5⅝x19½ or 19¾, 4 pieces, 100 to the bundle.

Cleats—¾x¾x11⅝, 4 pieces, 100 to the bundle.

Thirty-two (32) 6d cement coated box nails commonly used per box. Lighter material should not be used.

Forty (40) nails advisable for export.

(In addition boxes intended for export should be metal strapped or wire bound near each end to comply with the requirements of the steamship lines.)

(3) RECOMMENDED RULES FOR USE OF PAPER WRAPS

For apples use—

8"x8" paper for 252-234-216-198-180 packs.
9"x9" paper for 163-150-138-125-113 packs.
10"x10" paper for 100-96-88 packs.
11"x11" paper for 80-72-64-56 packs.

(4) RECOMMENDED APPLE PACKS FOR BOXES

Style of pack (arrangement)	Number in row (lengthwise)	Number of layers (depth)	Size or count
2-1	4-4	3	96
2-1	4-4	3	41
2-2	4-5	4	48
2-2	4-5	4	56
2-2	4-6	4	64
2-2	4-6	4	72
2-2	4-7	4	80
2-2	4-8	4-4	88
2-2	4-8	5-4	98
2-2	5-5	5	100
2-2	5-5	5	113
2-2	5-5	5	125
2-2	5-6	5	138
2-2	5-6	5	150
2-2	7-4	5	163
2-2	7-7	4-5	175
2-2	5-5	6-6	180
2-2	6-5	6	198
2-2	6-6	6	216
2-2	7-4	6	234
2-2	7-7	6	252

a—For flat apples.
b—For long apples.
c—Flat apples only.
d—All apples.

(5) AVAILABLE PUBLICATIONS ON PACKING APPLES

1. "Packing and Loading Basket Apples."—Virginia Circular.
2. "The Control of Apple Scald with Shredded Oiled Paper."—U. S. Circular 396.
3. "Packing Apples in Boxes."—U. S. Bulletin No. 1457.
4. "Preparation of Barreled Apples for Market."—U. S. Bulletin No. 1080.

Copies of any or all of the above may be secured upon request of the Division of Markets, State Office Building, Richmond, Va. The last two may be gotten also from the U. S. Department of Agriculture, Washington, D. C.

V. Acts of Virginia Assembly, 1927, as Amended in 1928 and 1930

Chap. 76.—An ACT to regulate the grading and marking of apples in closed packages; to authorize the Commissioner of Agriculture and Immigration to establish and promulgate official standard grades for apples and rules and regulations governing the marking of the same; to provide for the inspection of apples; the appointment of inspectors and their compensation; to prohibit violations of this act and to prescribe penalties therefor. Approved April 18, 1927.

Section 1. Be it enacted by the General Assembly of Virginia, That the Commissioner of Agriculture and Immigration is hereby directed to establish and promulgate from time to time official standard grades for all closed packages of apples, by which the quantity, quality, and size may be determined, and prescribe and promulgate rules and regulations governing the markings which shall be required upon packages of apples for the purpose of showing the name and address of the producer or packer, the variety, quantity, quality and size of the product, or any of them; provided, that the Commissioner of Agriculture and Immigration shall establish a grade for immature apples packed for export only, and an unclassified or similar marking for all apples not included in the other grades established.

It is the intent of this act that the Commissioner of Agriculture and Immigration, before establishing such standards, shall consult with the directors of the State Horticultural Society as representing the various apple growing sections of the State.

Sec. 2. Whenever such standard for the grade or other classification of apples under this act becomes effective, every closed package containing apples grown and packed in the State of Virginia and sold, offered or exposed for sale, or packed for sale or transported for sale by any person, firm, company or organization, shall bear conspicuously upon the outside thereof, in plain words and figures, such markings as are prescribed by the Commissioner of Agriculture and Immigration under the provisions of this act.

Sec. 3. The Commissioner of Agriculture and Immigration, through the Director of the Division of Markets, of the State of Virginia, shall be charged with the enforcement of the provisions of this act and for that purpose shall have the power:

(a) To enter and inspect personally, or through any authorized agent, every place within the State of Virginia, where apples are produced, packed or stored for sale, shipped, delivered for shipment, offered for sale, or sold and to inspect such places and all apples and apple containers and equipment found in any such place.

(b) To appoint, superintend, control, and discharge such inspectors and subordinate inspectors as in his discretion may be deemed to be necessary, for the special purpose of enforcing the terms of this act, to prescribe their duties and fix their compensation.

(c) Personally, or through any authorized agent or any such inspector, to forbid the movement of any closed package or packages of apples found to be in violation of any of the provisions of this act which have not been actually accepted by a common car-

rier for shipment in interstate traffic, and to require the same to be repacked or remarked. A carload of apples shall not be considered as actually accepted by a common carrier for shipment until the loading is finished, the car sealed and the bill of lading issued.

(d) Cause to be instituted through the Commonwealth's attorneys of the State, or otherwise, in any county or city of the State of Virginia, in which apples are packed, shipped, delivered for shipment, offered for sale, or sold, or may be found, in violation of any of the provisions of this act, prosecutions for such violations.

Sec. 4. When apples in closed packages are delivered to a railroad station or a common carrier for shipment, or delivered to a storage house for storage, such delivery shall be prima facie evidence that the apples are offered or exposed for sale.

Sec. 5. Any person, firm, company, organization or corporation, who shall violate any of the provisions of this act, shall be punishable by a fine of not more than five hundred dollars ($500.00) for each offense.

Sec. 6. No person, firm or corporation shall be prosecuted under the provisions of this act:

(a) When he or it can establish by satisfactory evidence that he or it was not a party to the packing, grading or marketing of such apples.

(b) When he or it can establish that the apples offered for sale have passed inspection by an authorized inspector of the State of Virginia and bear the official Virginia State inspection stamp, or by an inspector of the United States Department of Agriculture and found to be packed in accordance with the requirements of the Commissioner of Agriculture and Immigration of Virginia.

Sec. 7. If any section, subsection, sentence, clause or phrase of this act is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this act.

(Signed) J. H. MEEK,
Director, Division of Markets.

Approved August 4, 1931.
G. W. KOINER,
Commissioner of Agriculture
and Immigration.

VI. Summary of Important Changes in U. S. Apple Grades Made in 1931

General

(Applying to all grades)

The grades for 1931 apply to apples packed in any container. The 1930 grades did not apply to apples packed in the Standard Northwestern apple box.

"Color" in the 1930 grades, except with reference to the Gray Baldwin, was defined as meaning a good shade of red characteristic of the variety. The definition in the 1931 grade has been changed so as to pass for grade an apple with color of a lighter shade than that considered good red characteristic of the variety provided sufficient area is covered.

Only one defect was permitted on each apple in the 1930 grades. The 1931 grades provide that in addition to russeting permitted on an apple it may also have one other defect specified, or any combination of defects specified, the seriousness of which does not exceed the maximum allowed for any one defect.

The 1931 grades restrict serious insect injury to 5%. This restriction only applied to the Fancy grade in 1930.

A statement is included in the 1931 grades to the effect that although the tolerances specified are on a container basis any lot of apples shall be considered as meeting the requirements of a specified grade if the entire lot averages within the tolerance specified, provided that no sample from the containers in any lot is found to exceed the following amounts:

For a specified tolerance of 10 per cent, not more than one and one-half times the tolerance shall be allowed in any one package.

For specified tolerances of 5 per cent or less, not more than double the tolerance shall be allowed in any one package.

This provision is included in the 1931 grades for the first time, although it has been the inspection practice in certifying apples as to grade.

The 1930 grades provided a 5 per cent tolerance for undersize and a 10 per cent tolerance for oversize apples when the minimum and maximum diameters were marked on the container.

The 1931 grades provide that in case the undersize tolerance is not needed it may be used for apples larger than the maximum diameter. In other words, if there are no undersize apples they may be 15 per cent larger than the maximum stated on the package.

U. S. Fancy. The 1930 Fancy grade has been changed materially. It allowed practically no blemishes, but as written for 1931 the same blemishes are permitted as in U. S. No. 1 grade. The color requirements remain the same as in 1930. In other words, the requirements of the U. S. Fancy grade are now the same as U. S. No. 1, except that more color is required on red and striped or partially red varieties in order to meet U. S. Fancy Grade.

U. S. No. 1. The following changes have been made in the color requirements: Gravenstein, Duchess, Smokehouse, Red Astrachan and Summer Rambo changed from 10 per cent to a tinge of color; Williams and Red June changed from 15 per cent to a tinge of color.

The 1930 grade allowed an apple to have 25 per cent of the surface covered with smooth netlike russeting or one-tenth of the surface covered with smooth solid russeting or an area of one-half inch covered with rough or bark-like russeting. The 1931 grade allows any russeting not excessively rough on Roxbury Russet and other similar varieties. Russeting on other varieties is permitted which covers a total area of not more than 25 per cent of the surface in the aggregate except that—

(1) Smooth solid russeting which covers an area of more than 10 per cent of the surface in the aggregate shall be considered as damage unless the russeting is within or continuous with that in the stem basin or calyx cavity, in which case an additional 15 per cent shall be permitted, provided that the total area covered shall not exceed 25 per cent in the aggregate.

(2) Slightly rough russeting which covers an area of more than 15 per cent of the surface if confined to the stem basin or calyx cavity or continuous therewith, or such russeting which covers an area of more than one-half inch in diameter if it is not continuous with the russeting in the stem basin or calyx cavity, shall be considered as damage.

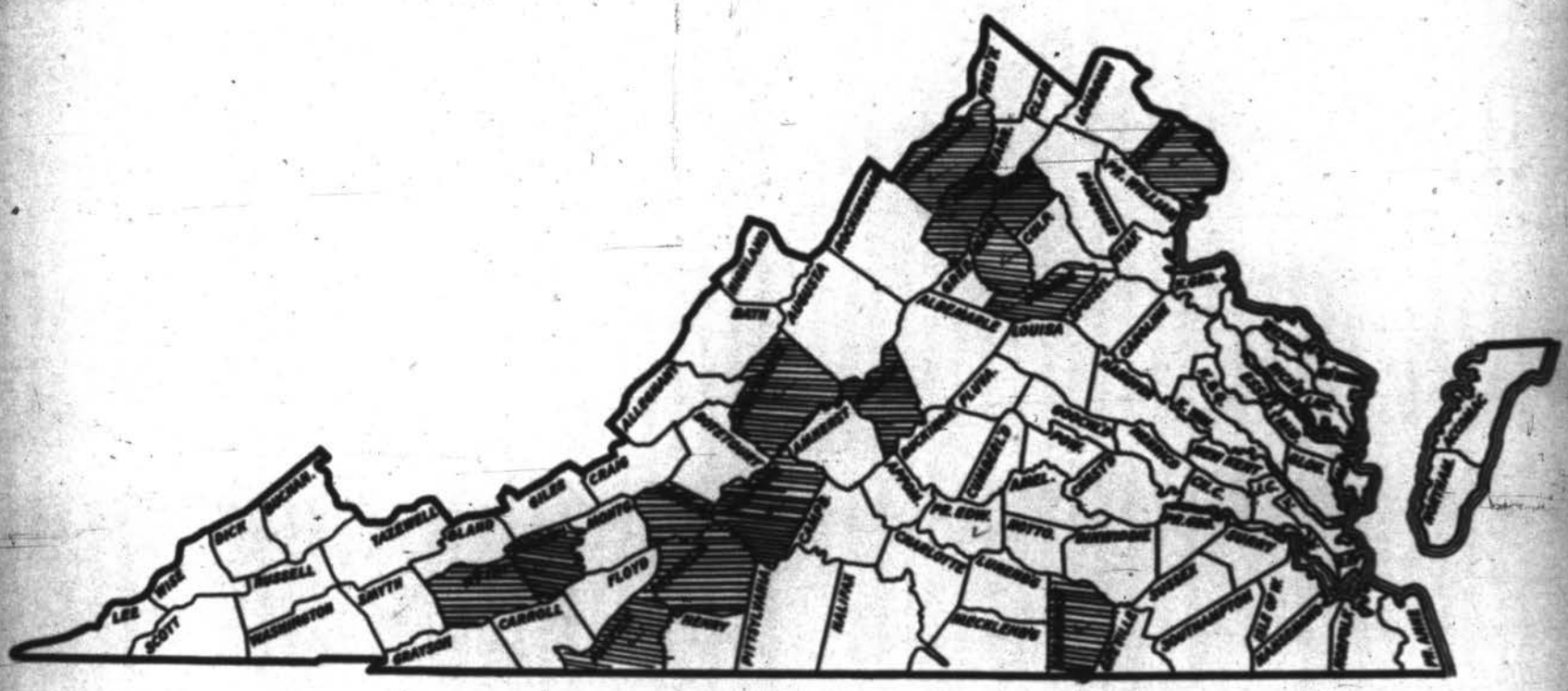
(3) Rough russeting which is well within the stem basin and is not readily apparent shall be permitted, but any other rough russeting which exceeds one-quarter inch in diameter shall be considered as "damage."

U. S. Utility. The 1930 grade allowed an apple to have any amount of smooth netlike russeting, one-half the surface covered with smooth solid russeting and any rough or barklike russeting which did not materially deform or disfigure the fruit.

The 1931 grade allows any russeting not excessively rough on Roxbury Russet and other similar varieties. Russeting on other varieties which exceeds the following is not permitted:

Smooth solid russeting which affects more than one-half of the surface in the aggregate, including any russeting in the stem basin, or rough or barklike russeting which detracts from the appearance of the fruit to a greater extent than the smooth solid russeting permitted.

U. S. Hail Grade. This is a new grade which has been added for the first time. It consists of apples which meet the requirements of U. S. No. 1, except that hail marks where the skin has not been broken and well healed hail marks where the skin has been broken shall be permitted provided the apples are fairly well formed.



GRADING AND PACKING DEMONSTRATIONS

secure uniformity in size, color, and quality where the fruit is packed in the orchard. Unattractive, dirty, and soiled packages detract from the appearance of the packages automatically place such packs in the cheap fruit class in the minds of the purchaser. To put out the right kind of a pack of good appearance it is essential to have good sorting, sizing, packing, and packing equipment as well as it is to have good spraying equipment. A good packing house is necessary for housing such equipment and to handle the fruit in an efficient way while it is being prepared for market. Considerable time has been given to this project. Several individual packing houses were built this year, specialists gave assistance in selecting the sites, furnished building plans, bills of material, and estimates on cost of building.

It is not enough that each grower put out a more uniform pack, but it is becoming increasingly more important to have more uniformity in the packs of the different growers. Cooperative and community packing houses offer a solution to this problem as well as it would help to reduce packing costs and make for economies in purchasing supplies. Though it has been difficult to finance building operations, community and custom packing houses were organized in five counties.

Results

Individual packing houses built	3
Community and custom packing houses built	1
Building rebuilt and converted into community packing houses	4

Outlook. Interest in community and cooperative packing houses is growing. We have been called upon to design two large cooperative packing houses for the coming year.

Storage Project - A. W. Yohe in Charge. In this project as with packing houses the Department is receiving the very closest cooperation from the Department of Agricultural Engineering. In fact, the success of this project is dependent upon such cooperation.

In years of large apple crops such as we have had in 1931, cold storage facilities are inadequate for the storing of both high and low grades of the crop. Again in such years prices are not high and the low grade fruit will not stand cold storage charges. Consequently, large amounts of this fruit are dumped on to the market during the harvesting season. The result is

BUTTER PACKING AT LESS COST GRAVES BROS.

COMMUNITY PACKING HOUSE CAPACITY 1,000 BU. PER DAY

market gluts and low prices for the better grades. Good roads and the motor truck have opened up local and even distant markets for this grade of fruit. But in order for this fruit to return something to the grower above the expense of hauling it must be fed into these markets only in such quantities as can be consumed in a rather short time. It has been felt that if some way could be found where by this fruit could be stored at a reasonably low rate for a few weeks it would be possible to relieve the market of these low grade gluts. The horticultural industry has perhaps suffered more from the lack of proper distribution than any one other thing. Common storages, it is believed, have an important place. As could be expected, interest in common storages has increased greatly this year. A number have been constructed this year according to plans and specifications drawn up especially for Virginia conditions.

The large 11,000 bushel storage was built in Franklin county by Mr. S. S. Crockett of Calloway. Mr. Crockett is very well pleased with his storage and states that it has been a profitable investment. The storage was constructed under his large apple packing house.

Demonstrations in the operation of common storages were continued during the storage season of 1930-1931 in three houses. Careful instructions were given for operations. The records secured showed considerable improvement over the previous season, demonstrating that careful operation is one of the most important factors for good results. In one house arrangements for additional ventilation was made under the advice of the cooperating departments and the results secured emphasize the fact that adequate ventilation is necessary for good results.

Results

Common storages built	6
Houses used for demonstrations in operation	3
Advisory visits	10

Outlook - From the good results growers are securing from their common storages it appears that the design of our storages is satisfactory and at the same time economical. The future should see even greater interest in this type of storage for holding low grade fruit off the market for short periods.

Service Project - D. A. Tucker in charge - Cooperating with the Department of Horticulture on this project are the Division of Markets and Dairy and Food Division of Richmond, and the Food and Drugs Division of the United States Department of Agriculture/

UNDERGROUND STORAGE - SMITH COUNTY

TEN THOUSAND BUSHEL CORNER STORAGE - FRANKLIN COUNTY
Mr. S. S. GUERANT

Almost every year since 1926 the question of arsenical spray residue on apples has been brought to the attention of Virginia growers as suspicious shipments were held up in foreign markets from time to time. In 1930 the residue became a most serious problem because of the severe drought. Emergency laboratories were established in the important fruit sections to rush through analyses on samples. Rush orders were sent in for commercial and home made supplies. Although chemists worked day and night in some cases, car movement was somewhat hindered, resulting in hardships to growers and shippers.

While 1931 was not as dry as in 1930, the need for more thorough spraying was greater and indications were that washing would again be necessary if Virginia fruit was to meet the reduced residue tolerance and move through the markets without being held up. It was felt that some plan should be worked out to avoid delays during the movement of fruit at harvest time.

A meeting was held in Richmond on August 8, for outlining a plan for handling the residue problem. Members of the Department of Plant Pathology and Department of Horticulture, Division of Markets, Dairy and Food Division, and representatives of the Federal Food and Drug laboratories were in attendance at this meeting. After a detailed discussion of the 1930 situation, plans for the coming season were taken up. It was finally decided that orchard samples would be taken after the last spray had been applied and far enough in advance of the harvesting season to give ample opportunity for analyzing the samples. If the analyses of the samples showed arsenic below the tolerance the particular orchard from which the sample had been taken was certified and the fruit from the same was passed by inspectors and did not require washing. If arsenic was found to be over the tolerance, the orchard was not passed. The plan was explained to the growers at a series of meetings.

On September 24, another meeting was held in Richmond at the time the fruit was moving to the markets. Changes in the plan previously adopted were as follows:

(1) Carlot samples taken by State inspectors and found to be over the tolerance will not be resampled by Federal inspectors as was done in 1930

(2) Orchards from which samples are taken which are under the tolerance will not be resampled unless visible residue is apparent.

(3) Orchards coming below tolerance will not be required to have further samples taken.

Federal-State inspectors did most of the sampling. This year's plan proved very successful and the fruit moved to markets without much delay though the crop was extremely large.

During the season packing houses were visited and all possible assistance was given growers.

While only a moderate per cent of the orchards showed residue above the tolerance and made it necessary to wash the fruit, many growers washed their fruit regardless, feeling that the improved appearance of the fruit was worth the extra expense. Quite a number of growers even went so far as to purchase washers and wash their crop although they were not compelled to do so because of residue. One grower purchased a large washer at a cost of $2,500 and felt that the machine more than paid for itself this year. This grower's fruit did not need to be washed because of residue.

Results

County	Total Number Analyses	Number Above Domestic Tolerance .018 grs.	Number Above Foreign Tolerance .01 grs.
Albemarle	448	69	115
Augusta	198	3	5
Amherst	19	0	0
Alleghany	8	0	0
Appomattox	1	0	0
Bedford	24	3	4
Botetourt	77	8	14
Buckingham	4	0	0
Clarke	78	4	13
Culpeper	18	0	0
Campbell	4	0	0
Franklin	21	0	0
Frederick	790	134	190
Fairfax	4	0	0
Floyd	7	0	0
Fluvanna	1	0	0
Fauquier	48	0	0
Giles	3	0	0
Henrico	3	0	0
Loudoun	48	4	6

[illegible]
Real Estate and Insurance
1108 Main St.
Richmond, Va.

July 18, 1951

Mr. A. H. Teske,
V. P. I.,
Blacksburg, Virginia.

Dear Mr. Teske:

Both Mr. Sandy and I greatly appreciate your very fine letter and the helpful suggestions which you make.

I was at the farm last week and Mr. Sandy and his son decided that we had best buy a Skyland Washing Machine and this we did. In this way we will put on the lube spray at the time you will later suggest and I wish you would mail to Greenwood Farms, Greenwood, Virginia A copy of your suggestions which you say you will make in a bulletin soon to be issued.

I enclose copy of a letter which I have written to Mr. Hutcheson.

Not only Mr. Sandy but I also appreciate your interest and that of Mr. Watson. With best wishes, I am

Yours very truly,

(Signed) O. H. Funsten

OHF/Ev

HOMEMADE WASHER TAKING CARE OF THE JOB

WASHING FRUIT WITH A $50 HOMEMADE WASHER

Montgomery	28	2	10
Madison	15	0	0
Nottoway	2	0	0
Norfolk	2		
Nelson	225	20	26
Orange	5	0	0
Page	21	2	2
Patrick	24	2	12
Pulaski	4	0	0
Rankin	118	2	11
Rockingham	108	3	4
[illegible]	1	0	0
Rappahannock	117	2	2
Rockbridge	17	1	1
Smyth	6	0	0
Spottsylvania	4	0	0
Shenandoah	175	4	2
Warren	26	1	2
Wise	4	0	0
Wythe	12	0	0
	3,021	306	415

Of the 3,021 samples analyzed, 11% were above the Domestic tolerance, and 15% were above the Foreign tolerance.

Outlook: Inasmuch as appearance plays an important part in distributing and marketing Virginia apple crops to the best advantage to the growers, the outlook is that washing will become a regular practice in the future.

Marketing Project - A. E. Weeks in Charge: In the past our greatest efforts have been along production lines. Virginia growers have made considerable progress in the growing of fruit crops. They have been steadily increasing their production. The time has come when they must think more about marketing these ever-increasing crops. Present markets must be expanded and new markets created. Foreign markets are of the greatest importance to the fruit industry of Virginia. It is more than likely that restrictions in foreign markets will be even increased in the future. It is impossible for the individual grower to improve, expand, or create markets. A good pack of the individual reaching the market occasionally is not sufficient. The uniform pack of the individual grower is not sufficient. There must be concerted action on the part of all growers. Virginia apples are placed along side of fruit from every other fruit producing section. Every package of any particular grade should be like every other package of

HOW THE TRABOX CONTAINER STACKS UP

A FRUIT OUTLET WITH POSSIBILITIES - THE ROADSIDE MARKET

that grade from every Virginia apple orchard. That package should be their regular and should contain fruit of quality. In order to accomplish this it will be necessary for Virginia fruit growers to organize.

Virginia growers are beginning to realize this more and more. That we are making progress is shown by the increase in co-operative and community packing houses and organizations.

Marketing has been stressed at every corner. Especially have we tried to put this over in our radio programs.

As a part of the Farmers' Institute, a one-half day horticultural program was arranged for fruit growers. The subjects for discussion were all directly or indirectly connected with marketing. (See exhibit).

Another very important phase of marketing which has not been given sufficient consideration in Virginia and that is the marketing of apples, peaches, and other fruits through the roadside market. Splendid opportunities exist for a good business in direct marketing, that is, grower to consumer, by this method in which the grower gets most of the consumer's dollar. Virginia has a big tourist trade, and there is no reason why many thousands of bushels of fruit could not be so marketed.

Here is a potential market which has never been developed. Growers are thinking of markets thousands of miles away when there is one right at their door.

There are a few growers who are taking advantage of this market and by so doing are able to dispose of all their orchard fruits at a premium without much overhead. A look at the accompanying picture should bring the importance of this phase of marketing. Nothing is so important to successful marketing as having the fruit reach the markets in prime condition. Proper handling is a big factor. For this reason whenever possible, we are locating cooperative packing houses as near to cold storages as possible in order that fruit may move through the packing house directly into the storage.

Irrigation Project - A. H. Tooke in Charge The Department of Horticulture is cooperating with the Department of Agricultural Engineering on irrigation work with tree and other fruits. While considerable irrigation is done in the east

17,710

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS
State of Virginia, Va. A. & M. College & Poly. Inst. & U.S.D.A. Cooperating
EXTENSION SERVICE

Blacksburg, Va.
July 21, 1931

Attention Fruit Growers:

The world apple crop for 1931 will be larger than the 1930 crop. If Virginia is to receive her share of the business, it will be necessary to put up a superior pack. It is the one way to bring the best returns to our growers with the greatest satisfaction to consumers.

Apple scald reduces net returns. How can it be prevented?

What about washing Virginia apples in 1931?

Every grower is interested in how his fruit is sold on the foreign market. In connection with the Farmers' Institute program, July 29-31, a special horticultural program has been arranged to bring to Virginia fruit growers information on these special subjects. Here it is:

July 30 2:00 What Apple Scald Cost Virginia Fruit Growers in 1931
Mr. D. F. Fisher, Bureau of Plant Industry
2:45 Will it Pay to Wash Virginia Apples in 1931?
Mr. D. F. Fisher, Bureau of Plant Industry
3:30 Selling Virginia Apples on the London Auction
Mr. J. O. Sims, London, England
4:00 Apple washing demonstration

Don't miss the Institute meeting in 1931, the McCormick Day program, barbecue, pageant, etc.

Where - Blacksburg, Va., July 29-31, and the Horticultural Program in the Agricultural Hall, Room 300.

Time - 2:00-4:00 p.m.

Date - July 29-31

Yours very truly,

Jno. R. Hutcheson

Director

on truck crops, orchard irrigation is thought of as only applying to the arid and semi-arid regions of the far west. However, if we should take a glance at the records which give us data on moisture and rainfall during the growing and fruit maturing seasons for a period of forty years we would find that there are not many years that fruit trees would not be benefited by supplying them with irrigation water.

There are many orchards in Virginia where irrigation offers opportunities for increasing production and improving size, color, and quality at a reasonable outlay.

Even with a season as 1931 when apparently there was sufficient rainfall to mature the fruit crops, the fruit in orchards now under irrigation, and in which growers applied water through irrigation, was far superior in size, color, and keeping qualities that from orchards which were not watered. Growers who have tested out irrigation are more enthusiastic than ever.

Results All orchardists who instanned systems previous to 1931 used water during the past season. All received splendid results. All extended their system to cover more acreage.

An irrigation system was installed for irrigating strawberries. A result demonstration was started on overhead or sprinkler irrigation in the fifty-acre apple orchard of Tavenner and Lee. Owing to delay in getting sprinklers on the ground early, the work was not started until late. It will be continued next year. In this demonstration arrangements are made so that accurate records can be secured on the amount of water used.

This orchard is rather closely planted. The trees are large and have reached a stage of alternate bearing. Part of the block was given two inches of water during the latter part of the season, even with this amount and applied late in the season, the fruit on the part of the orchard receiving water, was superior in size and color over the untreated part.

Outlook If financial conditions improve, there will be increased activity in this project, it has real promise where there is a convenient and cheap source of water.

Stationary Spray Plants - A. H. Teske in Charge There is a great deal of interest being shown by growers in stationary spray plants, but owing to the fact that orchard owners of Virginia have had two rather poor years they have hesitated in putting in stationary systems because the initial outlay

IN 1931 VIRGINIA HAD 30 INCHES OF RAINFALL. AT LEFT APPLES PICKED FROM IRRIGATED TREE. APPLES AT THE RIGHT FROM TREE THAT DID NOT RECEIVE IRRIGATION WATER. BOTH TREES ARE IN THE SAME ORCHARD

GETTING WATER WHEN AND WHERE YOU WANT IT

is rather large. Should they have a favorable year this type of spraying equipment will make rapid progress as it affords the best means of getting the orchard sprayed in a short period of time and less cost. It is especially adapted for rough and steep orchard sites.

Results

Orchard surveys made	7
Plants installed	0

Outlook The outlook is most encouraging.

Small Fruit Project - Dr. A. Tucker in Charge Small fruit demonstrations have shown that the bush fruits are splendidly adapted to Virginia soils and climate and can be successfully grown in all sections. Small fruits are healthful. They offer chances for profitable diversification in certain sections where there is over-production of other cash crops. Small fruit growing is in line with the live-at-home program. Virginia should supply her own people with these fruits rather than have them shipped in from the west and middle west sections.

Strawberries are a very important crop in Virginia, especially on the Eastern Shore. However, though growers have been making money on this crop, nearly every year production has been dropping off principally because the yield per acre has been gradually declining over the last ten year period from something over 2,400 quarts per acre to between 1,200 to 1600 quarts per acre. For this and other reasons, this project is being given special attention.

The principal work done with strawberries in 1931 consisted of the setting out of ten demonstration plots in Northampton and Accomac counties. The varieties used were selected from a large number that had been grown previously at the Eastern Shore Experiment Station.

Beflin and Premier are at present the principal varieties now grown on the Eastern Shore. They have several defects that the growers wish were not present. The Beflin is very early and yields well but after about half the crop is harvested, they become soft very readily. The Premier comes somewhat late and meets competition from Maryland varieties.

It was at the instance of growers and the Eastern Shore Produce Exchange that this project was undertaken with the object of

determining whether a new variety could be secured to replace either Haflin or Premier, preferably the Haflin because of its earliness.

Ten cooperators were secured for these demonstrations. Two cooperators were secured for each of the five main soil types of the Shore in order to determine the soil requirements of the different varieties.

One hundred plants of each variety were set in each of the plots. The varieties used are as follows:

U. S.D.A. #44
U.S.D. A. #49
U. S.D.A. #777
Blakemore
Jupiter
Howard Supreme
May Queen
Town King
Fruitland
Aberdeen
Premier
Haflin

The Premier and Haflin were set out to be used as checks and to compare with the other varieties.

At set time 700 pounds of bone meal were put underneath each plot. This was furnished through the courtesy of the Eastern Shore Produce Exchange. The plants were furnished through the courtesy of I. V. Townsend, the Eastern Shore Produce Exchange, and two local growers.

The plants were set out in February and this work was done under the supervision of the county agent and the small fruit specialist. Later in the year a check was made to determine the number of plants living and a preliminary examination was made of the condition of the planting, apparent vigor and plant-setting ability of each variety.

Most of the plantings had been well cared for and all varieties were doing well. The outstanding varieties, from the standpoint of vigor, in all plots were Blakemore, Jupiter, and Aberdeen.

It remains to be seen whether there is a correlation between first year growth and fruitfulness.

At harvest time next year a complete record will be made of the

yield and quality of each variety. In order to determine the value of each variety as a shipper, crates will be shipped to distant markets by truck and records made of the condition upon arrival, attitude of the trade, and price received. This will give information as to the commercial value of the varieties under test.

With the increase in Transmountain barrier, it will be desirable to determine the value of each variety from that standpoint. Arrangements have been made whereby it will be possible to freeze and store small lots of each variety.

Outlook: There is wide-spread interest in this project on the Shore and should a variety be found which is superior to the Redlip, it will mean added profits to the growers in that section of the State.

A bulletin on strawberry culture has been prepared.

Conserving: Low prices of many farm products, particularly in canning sections, have caused many farmers to look for other crops which may be grown profitably, at least as a sideline to the regular crop.

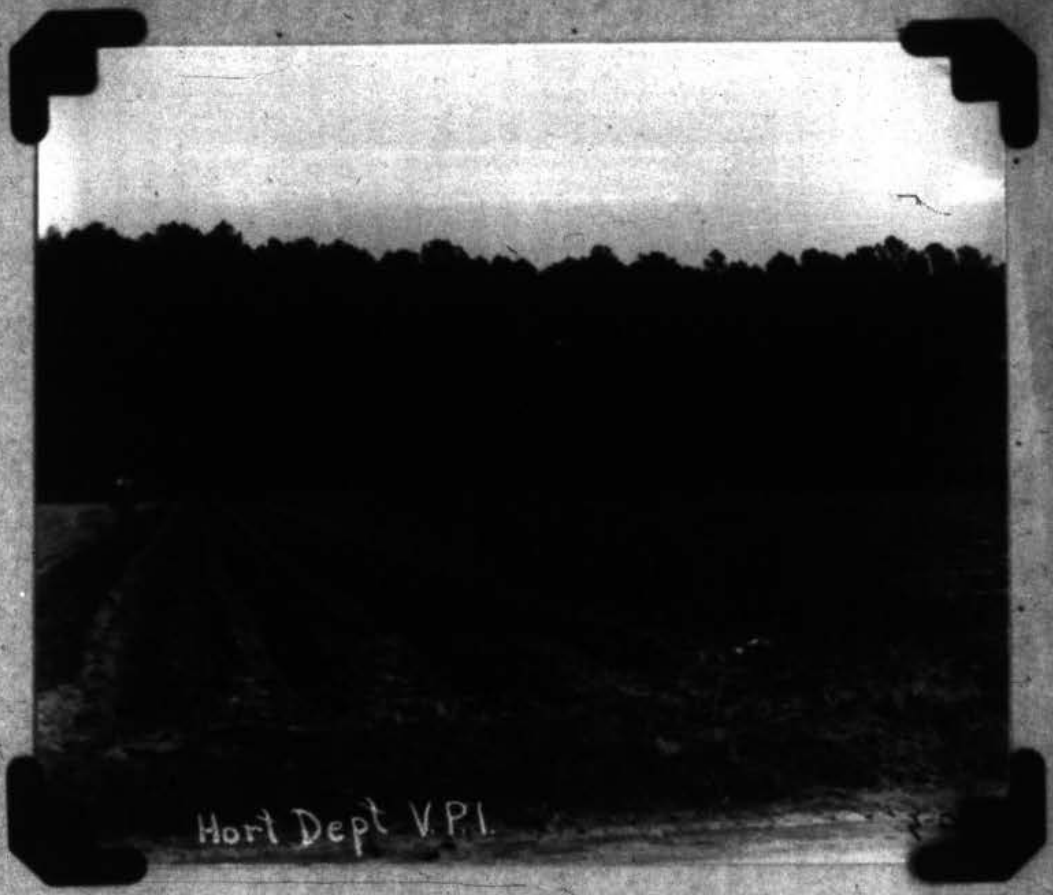
A meeting was held in Lancaster county early in the year to discuss the possibilities of raising small fruits. There were eighty people present and their interest was centered chiefly in the new Young Gooseberry, or Youngberry. As a result of this meeting, five farmers set out a half-acre each.

The plants that were purchased proved to be very poor quality and many failed to make a start. A sufficient number did grow, however, so that when the first crop is harvested next year a good idea of the yielding properties and quality of fruit may be obtained.

In spite of a rather unfavorable season the surviving plants made unusually good growth. A recent examination showed that in some instances canes had attained a length of twelve feet or more. Each plant had from five to eight canes.

The plantings were set with rows six feet apart and plants four feet in the row. The amount of growth made this year has proved that these distances are too close and in the future recommendations will be made to plant eight feet by eight feet.

In all but one instance the plantings were well cared for. In the one exception the plants had done fairly well in spite of neglect but showed the effect of competition with weeds when compared with the other demonstrations.



LAYING OFF AND PREPARING LAND FOR
STRAWBERRY VARIETY DEMONSTRATION.

STRAWBERRY DEMONSTRATION WITH INTER-CROP
OF ONIONS

REDUCING COST OF BRINGING INTO BEARING APPLE ORCHARD WITH STRAWBERRIES AS AN INTER-CROP

HARVESTING A LARGE CROP OF STRAWBERRIES
FROM DEMONSTRATION PLOT

The growers have all rooted some plants to fill in where plants died this year. In view of the good demand for plants these men are planning on raising plants for sale as well as raising fruit. Since the plants have proved so well adapted to that section they should experience no difficulty in raising a large number of plants with but little added labor.

Raspberries Considerable work was done with raspberries. Compared to other farm products raspberries brought good prices. This fruit, both red and black varieties, are hardy in the State. While there is more interest in this fruit there is not the active interest there should be compared to the possibilities this fruit has for increasing the farm income.

Outlook Small fruit production and especially raspberries, should be good since the fruit lends itself to the quick-freezing method which is making rapid progress. Local markets as well as distant ones will pay good prices for this fruit.

Virginia needs to grow more of this fruit.

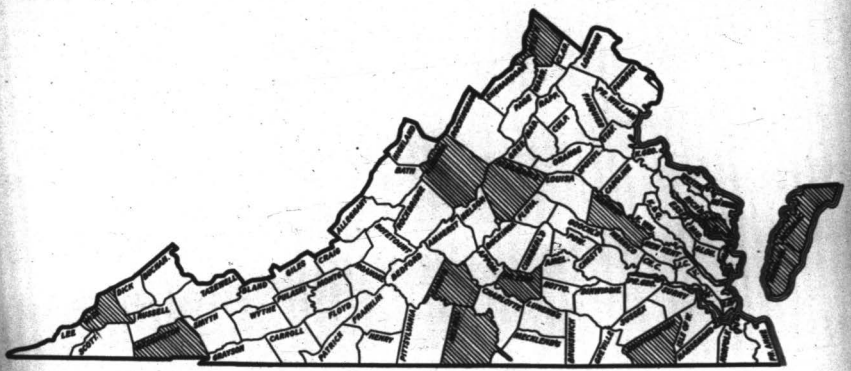
Grapes - J. F. Watson in Charge In the production of grapes it is hard for our growers to realize that they are handling a fruit crop and not a field crop. The result is that Virginia grape growers do not realize the best returns from this fruit. It is hoped that we can, through the slow process of education, build up a successful vineyard district. We are making progress along this line.

Black rot was most serious in one of our demonstration vineyards this year, the crop was ruined in about [illegible] hours.

Thoroughness in spraying, pruning, and orchard soil management is essential and many of our growers can only learn by experience. In demonstration vineyards late freezes, hail and black rot present our most serious problems.

Results More than twenty advisory visits and surveys were made, pruning demonstrations were given. A number of new plantings were made, specialists giving assistance in selecting sites and advising on varieties to plant.

Outlook Virginia can produce high quality grapes somewhat earlier than the principal eastern producing sections. There is a period of about a week between Virginia and northern producing centers in the manner of ripening. This should give Virginia a chance on those markets that consume large quantities of grapes. Roadside markets in Virginia offer excellent opportunity for disposal of considerable quantities of table grapes.



SMALL FRUIT, GRAPE AND NUT PROJECTS

A PROMISING WALNUT VARIETY

Nut Project - J. F. Dutton in Charge There is considerable interest in nut growing. It offers a good diversification for Virginia land owners. While wholesale planting of nut trees is not recommended for Virginia at this time, limited plantings of pecans, black walnuts and filberts should be encouraged where soil and climate are suitable.

Hardy pecans are recommended for shade and home consumption. In the southeastern part of the State it is even safe to grow the hardy southern varieties on a small commercial scale.

Black Walnuts The planting of black walnuts also offers possibilities in some sections. Especially should the planting of this nut be encouraged since it is well adapted not only to grove planting, but also scattered tree planting on waste land.

Improved varieties such as Stabler, Thomas, and Ohio, are recommended. Two seedlings produced in Virginia give unusual promise due to good growth of tree and excellent cracking nut qualities. Growers are being encouraged to propagate them.

Black walnuts are not only valuable for their nuts, but also for the wood which is perhaps the most valuable wood on the market at the present time.

Advice and assistance is being given to growers and those interested in planting. One planting in the State consists of forty acres. It is a demonstration orchard in which we are working on several smaller demonstrations in cultural methods.

Filberts As the best filberts have not been hardy enough to be recommended for commercial plantings. A tree cross between the American Hazelnut and European Filbert has given a promising hybrid. From all evidence this hybrid is a promising nut for Virginia and we are recommending it in a small way. After we have had an opportunity to test this nut under several conditions, more can be said about it.

Fruit Products - L. A. Tucker in Charge The generalizing effects that low grade fruit has had on the markets in recent years of heavy production including 1931, has lead Virginia growers to feel that the time has come when such fruit should not be allowed to compete with the better grades. This has created a great deal of interest in how best to dispose of this fruit. Until we have some way of converting the low grade fruits at least into something that will pay the cost of production it is going to be difficult to secure the full coop-

section of the growers to keep low grade fruit off the market.

Considerable ground work has been done this year. Several growers have been given assistance in planning cooperative, manufacturing cider and freezing of small fruits. But because of lack of facilities and funds for equipment for development along these lines it is going to take time to give the assistance and service that the industry needs.

Results

Plans for cooperatives	8
Conferences discussing plans for disposal of low grade fruit and management of cider manufacturing plants	8
Freezing demonstrations	8

Outlook There is great need for extensive work on this problem and every effort will be made to make more progress in giving the industry the needed service.

Fairs Specialists from the Department of Horticulture judge fruit, flower, and vegetable exhibits at a number of fairs and shows. In most instances the quality of the exhibits at a number of fairs and shows the fruit exhibits were outstanding.

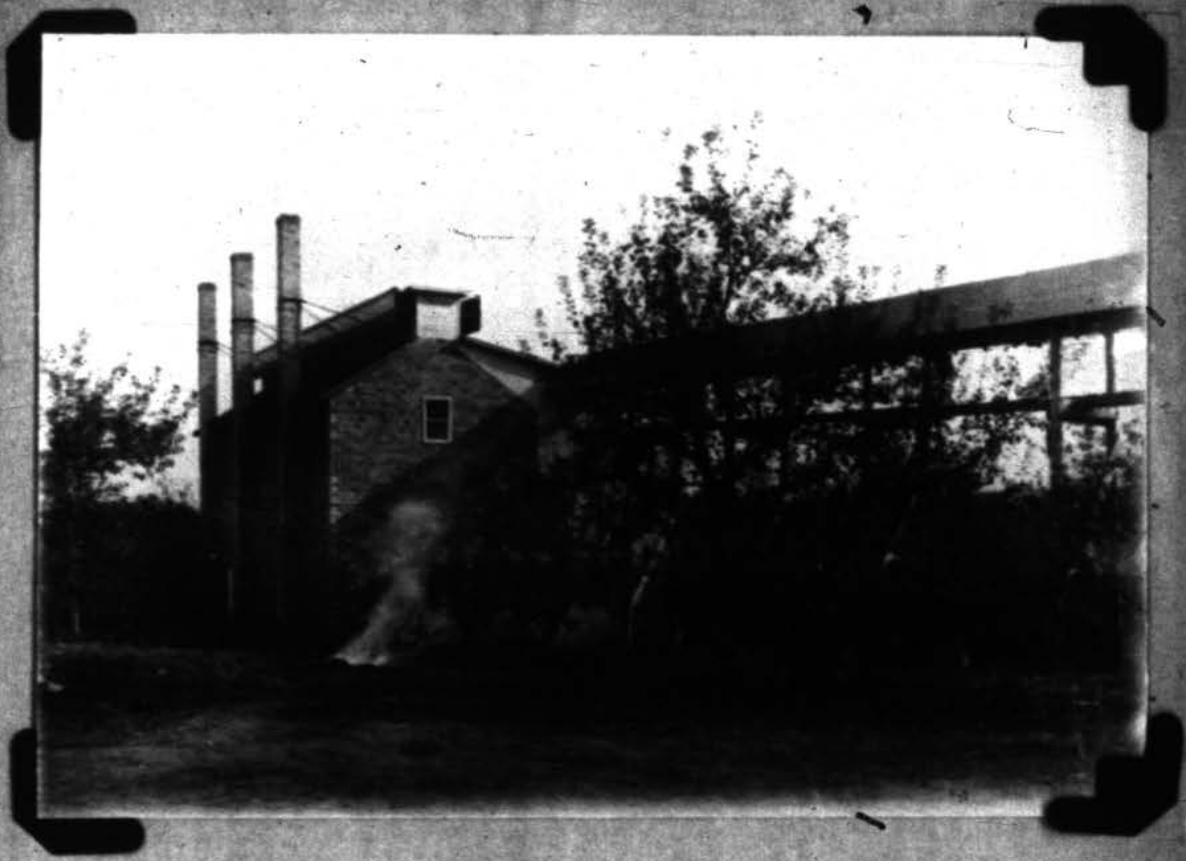
Results

Number of fruit and other exhibits judged

Missouri Valley Regional Fruit Show	1
State Fair (fruit)	1
Four County Fair	1
County Fairs	10
4-H Club Fair	1
Flower Shows	3

Meetings Specialists attended a number of meetings and conferences both in the State and out of the State.

Two members attended the extension meeting held in connection with the Horticultural Science meeting at Cleveland Ohio. This was by far the most important meeting of the year. By attending this meeting much advanced information was secured relating to extension problems in Virginia and we were able to render a larger and better service to our growers. Several conferences with United States Department of Agriculture and Federal Farm Board were attended for discussing cooperative marketing and coopera-



FRUIT BY-PRODUCTS
THE EVAPORATOR TOOK CARE OF THOUSANDS OF BUSHELS OF APPLES IN 1951 WHICH OTHERWISE WOULD HAVE BEEN A TOTAL LOSS AS WELL AS REMOVING A SERIOUS SOURCE OF INSECT INFESTATION

tive packing house problems as well as problems relating to disease control and soil problems.

The members of the Department of Horticulture in cooperation with related departments prepared the program for the Horticultural Society meeting as well as attending the meeting.

The Department of Horticulture was also represented at the Shenandoah-Cumberland Fruit Conference and took part in the discussions. This meeting was held in Winchester.

The writer was also in attendance at the Missouri Valley Horticultural Conference held in St.Joseph, Missouri. This is considered to be the largest fruit meeting of the middle west. At this meeting the writer addressed the conference on two subjects of great importance to the fruit industry-
"The Value of Grades and Standards"
"Cooperating Packing Houses"

Advertising Virginia produces apples which are unsurpassed in flavor, juiciness, and quality, but unless this is brought to the attention of the consumer, oranges, bananas, and other fruits will increase in consumption and popularity while the Virginia growers discuss surpluses.

Competition in the world's markets is becoming greater each year. The Northwest has found it necessary to supplement her outstanding apple packs with advertising to take care of the increased production. The results are very clearcut. This is, the movement of her increased crops at a profit with money handed to him when the fruit is ready to move, in other words, f.o.b. sales.

Progressive Virginia growers noted this and for the first time a real concerted advertising campaign was launched this year to tell the world about Virginia apples. A representative was sent into the European markets, another to the southern markets. Radio programs announce the goodness of Virginia apples.

Perhaps there is no other means of advertising which will reach the ears of so many people as the radio.

Radio The Department of Horticulture has, in cooperation with the Department of Plant Pathology, been putting on a radio pro-

Winchester, Virginia, Friday, March 27, 1931.

Apple Blossom Festival To Be Discussed By Popular Radio Pai

Professor Hort and Joe Apple are to discuss the Shenandoah Apple Blossom Festival in their April Radio broadcasts. These unique characters are on the air each month over WDBJ, Roanoke, and WRVA, Richmond, with a fruit story. The accompanying picture shows them putting over their latest skit, "Joe Apple Visits The Dentist."

You will be thrilled by hearing of the blissful anticipation wit which this son of Italia is lookin forward to those days of festival at Winchester, when nature in all her loveliness clothed in her most beautiful spring garments, hand in hand, with maidens, the fairest of the fair, marches forward to the consummation

The program is sponsored by the extension division of the Virginia Polytechnic Institute at Blacksburg.

just for the past two years and the responses received during the past year indicate that this offers a fertile field for getting information over to a vast number of people.

<u>Radio Programs in Horticulture</u>

Say It with Apples
Orchard Heating
Pruning the Bearing Orchard
Insects That Eat Apples
Apple Varieties
The Dormant Spray (Joe Apple and Prof. Hort)
Better Fruit Crops with Bees
Insect Outbreaks and the Weather
Peach Breeding Experiments
Joe Apple Visits the Dentist ((Joe Apple and Prof. Hort))
Efficient Spraying Means No. 1 Fruit Next Fall
Grape Breeding Experiments
Getting the Start on Orchard Pests ((Joe Apple and Prof. Hort))
Plum Breeding Experiments
The Apple Blossom Festival ((Joe Apple and Prof. Hort))
Handling the Berry Planting for Best Results
The Community Packing House in Virginia
Plum Curculio in Virginia Peach Orchards
Cherry Varieties
Joe Apple Says Good-bye to the Codling Moth ((Joe Apple and Prof Hort))
Cover Crops for Orchards
Does it Pay to Thin Fruit?
The Use of Bees in the Pollination of Fruit
Apples Consumers Like to Eat ((Joe Apple and Prof. Hort))

<u>Bulletins</u> While the demand for field work has again increased during the year of 1931, the department has been able to find time to make a start at getting out some of the printed material we are so urgently in need of.

The spray bulletin was prepared and published. A bulletin on Strawberry Culture has been prepared and is ready for the press. A bulletin on Peach Pruning is also in the course of preparation. It is hoped that this may be completed during the coming year as well as a bulletin on Common Storages.

<u>Outlook for the Coming Year</u> As the work from year to year is based on a long time program efforts will be along the same general lines as they were during the period just closed. Competition and restrictions in the foreign markets makes it imperative that Virginia growers put out a more dependable pack. Con-

ditions in the domestic markets have reached a point where low grade fruit must be restricted or these outlets will be lost.

At the same time it will be harder for growers to finance their orchard operations during the coming year. The future will require our best efforts to give such aid as will help the growers first of all, to grow better fruit with the equipment available. Orchard management methods which will reduce capital outlay and give similar results, are to be stressed.

Community and cooperative packing houses with marketing organization along the same lines are to be given special attention. Grading, packing, and better handling need to be brought to the attention of the growers more forcibly.

Projects which offer opportunity to reduce costs such as stationary spray plants will not be over-looked.

With the movement to eliminate low grades from the markets gaining ground the by-products project should be given vigorous attention.

Small fruits offer splendid opportunity for diversification and a way to increase the income of our growers.

It is anticipated that many questions will come up regarding new spray materials and other products which the grower will be asked to buy.

There never has been a time when the services of the department have been needed more than they will be in the coming year.

__Statistical Data:__

Days in the office	[illegible]
Days in the field	468
Agents visited	187
Counties without agents	35
Extension and other meetings	39
Attendance	4,578
Letters	2,088
Bulletins	9,258
Different circular letters	15
Circular letters sent out	47,578
Days annual leave	67
Miles traveled	35,625
Demonstrations given	254
Attendance at demonstrations	3,205

Fairs judged..[illegible]
Conferences...[illegible]
Visits and fruit surveys............................[illegible]
Radio talks...[illegible]
Radio dialogues.....................................[illegible]
Broadcasts over NBC chain...........................2
Broadcasts over WRVA................................4

Respectfully submitted,

A. H. Teske
Extension Horticulturist

AHT:[illegible]