333

EASTERN

UTILIZATION RESEARCH

BRANCH

AGRICULTURAL RESEARCH SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

ARC-227

500 E. ST. MERMAID LANE

PHILADELPHIA 18, PA.

DIRECTIONS FOR REACHING THE EASTERN BRANCH LABORATORY

In conjunction with the map of the Philadelphia area (opposite), the following routes are suggested for reaching the laboratory, which is located at 600 East Mermaid Lane, Wyndmoor, Springfield Township, Montgomery County, Pennsylvania.

From the Downtown Area:-

Subway and Bus. Take northbound Broad Street Subway at City Hall, or at any subway station on Broad Street (including North Philadelphia), to Olney Avenue, which is the end of the line. When paying fare ask for bus exchange. Board "L" bus marked "Erdenheim" at northwest corner of Broad Street and Olney Avenue. This bus goes out Stenton Avenue. Leave bus at Mermaid Lane and walk east two blocks to building. This is the nearest direct transportation to the laboratory.

Reading Railroad. Take Reading Railroad Chestnut Hill suburban line at Reading Terminal, 12th and Market Streets, or Wayne Junction (connecting with & O.) to Wyndmoor Station. Go east about five blocks on Mermaid Lane to building.

Pennsylvania Railroad. Take Pennsylvania Railroad Chestnut Hill suburban line at the Suburban Station, 17th and Arch Streets, or at the North Philadelphia or 30th Street Stations, to Chestnut Hill, which is the end of the line. This is about 1-1/2 miles from the laboratory. Either take taxi at station or southbound "L" bus marked "Broad-Olney Subway". Leave bus at Mermaid Lane and walk east two blocks to building.

VISITING HOURS. Visitors are welcomed to the laboratory during working hours, which are from 8:30 a.m. to 5:00 p.m., Monday through Friday.

TELEPHONE. Chestnut Hill 7-5800.

ORGANIZATION
of
UTILIZATION RESEARCH[1]
AGRICULTURAL RESEARCH SERVICE

Administrator, Agricultural Research Service	B. T. Shaw
Deputy Administrator for Research	(Vacant)
Director, Utilization Research	G. E. Hilbert
Assistant Director, Utilization Research	C. F. Speh
Assistant Director, Utilization Research	Walter M. Scott

EASTERN UTILIZATION RESEARCH BRANCH

Chief of Eastern Branch	P. A. Wells
Associate Chief of Eastern Branch	R. E. Lothrop
Special Assistant to Chief (Industrial Liaison)	R. H. Morris, III
Business Manager of Eastern Branch	P. K. Knierim
Technical Assistant to Chief	W. P. Ratchford
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Research Section Heads:

Analytical, Physical-Chemical and Physics Section	B. A. Brice
Animal Fats Section	W. C. Ault
Animal Proteins Section	T. L. McMeekin
Biochemical Section	J. J. Willaman
Biologically Active Chemical Compounds Section	T. D. Fontaine
Engineering and Development Section	R. K. Eskew
Fruit and Vegetable Section	C. F. Woodward
Hides, Tanning Materials and Leather Section	J. S. Rogers

[1] DETAILS OF THE FIVE UTILIZATION RESEARCH BRANCHES ARE GIVEN ON THE INSIDE OF THE BACK COVER.

EASTERN UTILIZATION RESEARCH BRANCH[1]

BACKGROUND

The Eastern Utilization Research Branch is a research laboratory searching for new and better ways to utilize farm products. This search has a threefold objective: (1) to provide more income for the farmer from the crops which he grows, (2) to assist industry in converting agricultural raw materials into new and improved products, and (3) to devise means for making these products available to consumers at reasonable costs.

In 1938 Congress enacted legislation authorizing the establishment of four regional research laboratories to search for new and wider outlets and markets for farm commodities. The legislation directed the Secretary of Agriculture to establish, equip, and maintain four regional research laboratories, one in each major farm producing area, and at these laboratories to conduct research to develop new and extended markets and outlets for farm commodities. It was the intent of the act that the research be devoted primarily to those commodities in which there are regular or seasonal surpluses.

As a preliminary step, Congress directed that a survey be made to find out what research was being conducted in these fields, to obtain suggestions for needed research, and to acquire information that would be helpful in fixing the scope of the research programs of the laboratories. A report of this survey has been published as Senate Document No. 65, 76th Congress, entitled "Regional Research Laboratories, United States Department of Agriculture." Copies may be obtained from the Eastern Utilization Research Branch.

[1] 600 East Mermaid Lane, Wyndmoor, Pennsylvania (Springfield Township, Montgomery County).

More recently Congress enacted legislation called the "Research and Marketing Act of 1946," which authorized additional research on the utilization of agricultural commodities. Under this act, the Eastern Branch has undertaken utilization studies on three new commodities and expanded the research on some of the commodities already under investigation.

In the 1953 reorganization of certain functions and activities of the Department of Agriculture, research work was arranged in five groups under the Agricultural Research Service. Utilization Research, one of the five groups, was in turn organized in five branches, four of which include the corresponding regional research laboratories, and a fifth branch (Washington, D. C.) consisting of three sections doing research on allergens, dairy products and meat. Through the Agricultural Research Service, the scientific investigations of the Department of Agriculture are coordinated, and working relationships are maintained with the State Agricultural Experiment Stations.

REGIONS AND COMMODITIES

The Eastern Branch laboratory serves the eastern area, comprising the New England States, New York, New Jersey, Pennsylvania, West Virginia, Maryland, Delaware, Virginia and Kentucky. The work of this laboratory is organized under eight major research sections. The commodities assigned for study are: Apples and other Eastern deciduous fruits, potatoes and other Eastern vegetables, tobacco, milk products, animal fats, hides, tanning materials and leather, honey, maple products, wool by-products, cortisone precursors, and biologically-active chemical compounds in plants.

The other three laboratories[2] are organized somewhat similarly. The research of the fifth branch is conducted in laboratories in the Department of Agriculture building in Washington, D. C. The buildings and facilities of the four laboratories are also similar. Commodities important to its area have been assigned to each branch. Research on a few commodities is divided between branches.

BUILDINGS

The Eastern Branch laboratory is built on a 31-acre tract of land located just outside Philadelphia. It is close to the great processing industries along the Delaware River and to reference libraries and research activities at the University of Pennsylvania, the Franklin Institute, and other educational institutions.

The main laboratory building is a U-shaped structure of three stories and basement. Offices, library, conference rooms, and other general services are in the front of the building, which is the 211-foot base of the U. One of the wings contains research laboratories equipped for work in chemistry, physics, and crobiology. The other contains a few laboratories, but most of the space is used for pilot-plant operations. Since pilot-plant research is stressed, almost one wing, or roughly one-third of the building, is utilized for pilot-plant investigations. Service shops and special research rooms are located in the basement. Altogether the building contains 72 research laboratories, in addition to the pilot plant and special research rooms. For the most part, the research laboratories are arranged in 3-bay units, consisting of two research rooms with a utility room and two small offices between them. Both the offices and the laboratories are air-conditioned.

A building somewhat removed from the main building provides three large laboratory rooms especially designed for hazardous operations, such as large-scale

[2] ADDITIONAL INFORMATION IS GIVEN ON THE INSIDE OF THE BACK COVER.

solvent extractions and high-pressure experiments. Another building provides space for large-scale pilot plant drying operations.

GENERAL STAFF GROUPS

In addition to the technical employees conducting research, there are a number of groups in the Branch engaged in activities that support and assist the research program.

The Office of the Chief assists the technical personnel in activities such as industrial liaison; prosecution of patents; informational activities, including the handling and editing of technical manuscripts; and photographic, photostatic and glass-blowing services.

Under the Office of the Business Manager come the general administrative functions, including personnel and purchasing and property management, budget, bookkeeping, auditing, and the central files. The Business Manager also works with the scientists in developing research contracts and the various typ of formal and informal agreements made with cooperating groups in connection with the research program.

The Mechanical Superintendent is responsible for operation of the mechanical shops, which render valuable service to the research groups in the construction and maintenance of special research equipment. The Mechanical Superintendent is also responsible for operation of the heating plant, air conditioning system and other services and the maintenance of buildings and grounds.

The Department Library operates a branch in the building, which provides technical library service. The staff consists of a librarian and one assistant.

RESEARCH PROGRAM

The principal fields of work and the objectives of the eight research sections of the laboratory are as follows:

ANIMAL PROTEINS SECTION. This Section is seeking to extend the uses of and to develop improved products from the proteins of milk and hides through basic studies on the composition and properties of these substances. Methods are being developed for the isolation and characterization of pure proteins. Investigations on the chemical structures and fundamental physical properties such as molecular size, shape and hydration of native and denatured milk proteins are being directed toward a better understanding of factors affecting the stability of milk proteins during processing. The studies on collagen are concerned with developing methods for improving the process of making leather. Studies are also being carried out to develop economical methods for the biological oxidation of dairy wastes, which now constitute a serious stream pollution problem.

FRUIT AND VEGETABLE SECTION. This Section is assigned the task of finding new and extended uses and improved processing methods for Eastern fruits and vegetables. One phase of this work involves developing improved food products from apples and other Eastern fruits by processes such as application of fruit essences to improve palatability. Considerable emphasis is also being given to developing new and improved dehydrated food products from potatoes and other Eastern vegetables, which include such products as potato granules, potato chip bars, and French-fried vegetables.

HIDES, TANNING MATERIALS AND LEATHER SECTION. This Section studies the raw materials and processes used in making leather, one of our critical materials.

The principal raw materials are: (1) Hides and skins of various animals, such as cattle, sheep and goats, and (2) vegetable and mineral tanning agents, which consist of tannins obtained from chestnut wood, hemlock bark, sumac leaves, and similar vegetable sources, and the salts of chromium and aluminum. The Section is seeking new and better sources of domestic vegetable tannins to reduce the country's dependence on imported tannins. It is also trying to develop new and better types of leather through chemical modification of the hide proteins, and to devise methods of preventing deterioration of leather goods. Another important objective is to devise methods for preventing spoilage of hides and skins before tanning. Basic studies on the composition, structure, and behavior of the tannins are also included in the program.

ANIMAL FATS SECTION. A major objective of the Animal Fats Section is to extend industrial uses for animal fats and wool grease. The research is directed to the preparation of products having potentially large volume outlets, such as new plastics, plasticizer, waxes, detergents, feeds, and similar articles which animal fats, particularly the inedible grades, are used as raw materials.

Another important objective is to improve the properties of edible animal fats by developing information on the relationship between chemical constitution and physical characteristics.

BIOCHEMICAL SECTION. The Biochemical Section is assigned the task of finding new and extended uses and improved processing methods for maple products and honey. The work on these commodities involves studies such as the development of a high-flavor maple sirup and the use of honey in commercial baking. The Section is also engaged in a search for substances in plants which can be used to synthesize the drug cortisone and similar medicinals.

BIOLOGICALLY ACTIVE CHEMICAL COMPOUNDS SECTION. This Section is engaged in investigations of the biologically active chemical compounds present in plants which may be of medicinal value. Studies are concerned with separating the compounds from plants in relatively pure form and determining their properties and characteristics. Chemical modifications of the compounds are also investigated for possible applications in the medical and related fields. This Section also studies the biochemical factors in plant disease resistance and synthesizes compounds for studying the chemical action of plant-growth regulators.

ANALYTICAL, PHYSICAL-CHEMICAL AND PHYSICS SECTION. The Analytical, Physical-Chemical and Physics Section conducts specialized analytical, physical, and physical-chemical investigations on the various commodities assigned to the laboratory. The work of this Section includes fundamental studies with specialized instruments, development of new and improved analytical methods, and making chemical analyses and physical tests for other units of the laboratory. Special instruments include spectrophotometers, X-ray diffraction apparatus, and the electron microscope. The service work includes a wide variety of chemical analyses of the elements and constituents present in the commodities under investigation. This Section also evaluates the fibers, plastics, rubber, and other products developed in the laboratory, determining such properties as hardness, resilience, tensile strength, and resistance to heat, aging, and solvents.

ENGINEERING AND DEVELOPMENT SECTION. A large part of the work of the Engineering and Development Section is pilot-plant research. Research work at the laboratory does not stop at the test-tube stage. Processes and products that look promising for commercial development are transferred to the pilot plant. Here are studied the probable type of equipment required

for large-scale operation, the materials of construction, the behavior of the reactants and the product in large bulk, and the cost of manufacture. At this stage, many of the "kinks" incidental to industrial production are ironed out. This Section also designs equipment and large-scale apparatus, provides engineering consulting service for the entire laboratory, and prepares samples of products developed by the laboratory for commercial evaluation.

EXAMPLES OF PROGRESS

The following developments represent some of the achievements of scientists at the Eastern Branch. In addition to these and other successful projects useful to industry and agriculture, much basic research has been done to lay the foundation for future developments. It is from this basic exploratory research that future specific accomplishments will come.

Rutin from Buckwheat and Tobacco. In the course of a study of the composition of tobacco, a chemist of the Eastern Branch obtained some rutin from flue-cured tobacco. The occurrence of rutin in tobacco and other plants had been known for many years, but no use had ever been found for it. Its structure, however, suggested to the chemist that rutin might have physiological activity on the capillary blood vessels and he persuaded several physicians to conduct clinical tests with it. These physicians found that rutin was effective in treating fragility and permeability of the capillaries. These first tests were followed by extensive clinical evaluation by physicians throughout the world. The results of these studies indicate that rutin is valuable in the treatment of a variety of diseases associated with capillary weakness. There is also indication that rutin may have some protective action in reducing injury from frostbite and from exposure to ionizing radiation.

Because of the rather low rutin content and high cost of flue-cured tobacco, the only type of tobacco that contains rutin in appreciable quantities, other sources of rutin were sought. Buckwheat has proved superior to other domestic plants investigated, having about 10 times as much rutin and costing only a small fraction of the price of flue-cured tobacco leaves. The drug is in the leaves and blossoms, the maximum content being present before seeds are formed. Buckwheat grain is totally lacking in rutin.

The Eastern Utilization Research Branch prepared the rutin for the initial clinical and pharmacological studies. Before rutin could be produced commercially, however, many problems had to be solved. Methods were developed for the production of a dried buckwheat leaf meal and for the extraction and purification of rutin for pharmaceutical use. As a result of this work, rutin became commercially available in 1946. It is now established as a valuable therapeutic agent in world-wide use for the treatment of hemorrhagic disorders.

Chemically, rutin is a flavonol rhamnoglucoside. The sugar portion can be split off, leaving the flavonol quercetin. Quercetin is active at lower dosage levels than rutin and is effective in most of the cases which do not respond to rutin therapy.

As a result of this research, medical science has been provided with a means of controlling capillary dysfunction, and it has stimulated world-wide research on further evaluation of rutin and related compounds in medicine and nutrition.

Apple Sirup. A type of bland apple sirup developed by the Eastern Branch was used commercially as a humectant for tobacco during the Second World War, as a replacement for glycerine. More than 9 million pounds were produced. A circular, AIC-37, describes the preparation and uses of bland apple sirup.

Fruit Essences. A practical process for recovering the volatile aroma, or flavor, of fresh fruit juices in concentrated form has been developed by chemical engineering research at the Eastern Branch. One volume of the concentrated aroma, or "essence," contains all the volatile flavor from 150 or more volumes of the fresh juice. The essence is a clear, water-white solution that can be kept for long periods at room temperature without deterioration.

There are many uses for essence. When added to fruit jellies and jams or other fruit products, it restores the fresh fruit flavor, which is usually lost in the manufacturing process. Another important use is addition of essence to concentrated fruit juices. The fruit juices may be the familiar 4-fold frozen concentrates, or the 7-fold concentrates developed by the Eastern Branch. Addition of essence restores the delicious fresh fruit flavor. Other uses are in enhancing the flavor of ices, sherbets, confections, gelatin desserts, table sirups, flavor extracts, dairy beverages and carbonated beverages.

The process of recovering the volatile flavors of fruit juices has found ready commercial acceptance. Basic engineering data, together with suggestions for possible uses for the product, have been given to industry, and 30 or more companies are now producing fruit essences by this process.

The process has also been adapted to the recovery of fruit aroma in preserve manufacturing. The essence development provides an outlet for sound cull fruit and a use for apple skins and cores, which would otherwise be wasted.

Concentrated Fruit Juices. The essence research has led to the development of 7-fold, or "superconcentrated," apple and grape juices. One volume of the concentrated products is diluted with 6 volumes of water to make the full-flavored drinking juice.

In addition to providing full-flavored fruit juice in compact form, the new products have the advantage of not requiring frozen storage. Ordinary refrigeration--35°F.--is adequate. The resulting economies in packing, storing and transportation make the superconcentrates attractive to the Armed Forces. Marketing of the superconcentrates for home use is now under study.

Improved Oleic Acid from Animal Fats. Research by chemists of the Eastern Branch has led to the commercial production of an improved grade of oleic acid. The process starts with inedible tallow or grease and produces oleic acid of 90 percent purity. If desired, this oleic acid can be distilled to give a product of 98 percent purity.

The manufacturing cost of the better quality oleic acid is only slightly greater than that of the older commercial oleic acid, which is known also as "red oil." Red oil contains only 60 to 75 percent oleic acid. Some of the impurities cause red oil to darken and become rancid, making it unsuited for many of the purposes for which it otherwise would be satisfactory.

Several companies are now making the high quality oleic acid on a large scale.

Improvement in Keeping Quality of Home-Rendered Lard. The Eastern Branch has developed a simple method for keeping home-rendered lard fresh and edible twice as long as formerly. The method consists in adding about 5% of vegetable shortening (such as Crisco, Spry, and Snowdrift) to the lard at the time it is being made. By this addition, the natural preservatives (tocopherols) present in vegetable oils provide protection against rancidity; lard and other animal fats contain only traces of tocopherols. A circular issued by the Eastern Branch (AIC-157) describes the method.

Many farmers and local custom butchers are using the process, with resultant savings estimated at $7 million a year.

Animal Fats in Plastics. Basic research by the Eastern Branch and supplementary research and development work in industry have led to large-scale use of specially treated animal fats and vegetable oils as plasticizers in making vinyl plastic products such as garden hose, floor tiles, upholstery material and transparent raincoats.

The primary purpose of a plasticizer is to make an otherwise rigid and brittle material soft and flexible. The plasticizers from fats and oils do this and, in addition, are especially useful for the chlorine-containing vinyls, shielding them against discoloration and weakening caused by the hydrochloric acid formed when the plastic is exposed to heat or sunlight.

The method for converting fats and oils to plasticizers is relatively simple. The acid part of the fat is treated with hydrogen peroxide to give a specially-oxidized oil. The method is cheap and practical and can be used on a wide variety of animal and vegetable fats and oils.

Animal Fats in Hot-Dip Tinning. As an outgrowth of research of the Eastern Branch, and Department of Agriculture financed research at the Armour Institute of Technology, animal fats, slightly modified, are now used commercially as tinning oils in the hot-dip tin-plating of steel sheets. The animal fats, altered by simple inexpensive treatment, are used in place of imported palm oil. They are equal to palm oil in every respect and better in some. The tinning oil prevents contamination of the tinned sheet with tin oxide impurities, thus permitting production of a uniformly bright tinned plate.

Development of satisfactory tinning oil from commercial grades of grease and tallow provides three important advantages. It provides a cheaper tinning oil, creates a ready potential market for surplus fats and reduces dependence on palm oil imports during national emergencies.

Animal Fats in Feeds. A hypothesis advanced by scientists of the Eastern Branch, and confirmed by Department of Agriculture financed work at the American Meat Institute Foundation, is opening up a very large market for surplus animal fats as a component of feeds for livestock and poultry. The fat is added to the extent of about 1 to 6 percent. Since fat provides twice as many calories per pound as carbohydrate or protein, feeds with added fat are high-energy rations. Such feeds are, moreover, less dusty and hence more easily handled.

In the initial experiments, both dogs and poultry thrived on diets containing increased amounts of animal fat. These results led to wide-spread additional trials with other animals. As a result of the success of these trials, this use for fats has expanded rapidly.

Improved Soap Emulsifiers for Synthetic Rubber Manufacture. Research by Eastern Branch chemists, working in collaboration with scientists at universities and industrial laboratories, was responsible for a 20% increase in the capacity of plants producing synthetic rubber. When production of GR-S rubber first started, the polymerization process, i.e., the combination of butadiene and styrene suspended as minute globules in an emulsion, was erratic and troublesome. It was suspected that the tallow soaps used to prepare the emulsion sometimes contained substances that retarded the polymerization.

The Eastern Branch, working with universities and industrial laboratories, studied tallow and tallow

soaps as part of the research program of the Office of Rubber Reserve. These joint studies confirmed that the trouble was due to the tallow soap, and the researchers found that mild selective hydrogenation of the tallow prior to its conversion to soap eliminated the difficulty. This treatment was adopted by industry, resulting in faster and more uniform polymerization and, for the first time, permitted a fixed production cycle. These improvements stepped up production 20% without any increase in plant facilities and later made it feasible to use a continuous polymerization process, with further increase in production.

The Eastern Branch developed an improved spectrophotometric method of analysis that proved to be extremely valuable for determining when the right amount of hydrogen had been added to the fat so as to eliminate the undesirable constituents. The analytical method was adopted throughout the industry and was incorporated in the specifications used in purchasing the soaps.

The research not only contributed substantially to the synthetic rubber program during the Second World War but also retained for the American farmer an important market for animal fats.

Acrylic Rubbers. A new family of synthetic rubbers called "Lactoprenes" has been developed by chemists of the Eastern Branch, and some of them are being produced commercially. The rubbers can be prepared by converting starches or sugars into lactic acid by fermentation and this in turn converted to acrylic esters by chemical means. The esters are converted to rubbery materials by a process called polymerization. These materials are then compounded and vulcanized like natural rubber.

The Lactoprenes have outstanding resistance to dry heat and to hot oils, so they are suitable for use as il seals in automotive transmissions and as gaskets n other places where resistance to heat and oils is eeded. They have great endurance to repeated flexng, low gas-permeability, and good resistance to xidation, deterioration by sunlight, and enlargement f cuts. These properties make the Lactoprenes more uitable than natural rubber or other available ynthetic rubbers for many special uses.

Vegetable Wastes as Sources of Chemicals. The Eastern Branch has developed a process for the preparation of leaf meals from vegetable wastes, which are rich in valuable chemicals, vitamins and protein. As a result of this development, leaf meal from waste is now a commercial source of chlorophyll, carotene (provitamin A) and xanthophyll.

The residual meal from the extraction of chlorophyll and vitamins contains 24 to 38 percent protein, which is well balanced in its amino acid content. Hence it is sold as a source of protein in livestock and poultry feeds.

Essentially the process consists in rapidly drying the green leafy waste in a conventional type continuous rotary drier to the stage where the leaf blades, which contain most of the valuable substances, are dry and brittle, while the stems and midribs are still moist and tough. The embrittled portion is readily separated from the stems and midribs by mechanical means.

Shrink Resistant Leather. The Eastern Branch has developed a method of retanning vegetable-tanned leather so that is resists shrinking and cracking. Vegetable-tanned leather, although excellent in many respects, tends to shrink and crack when exposed to alternate wetting and drying. In normal use shoe insoles are exposed to warm humid conditions, followed by drying, and therefore insole deterioration is a common cause of shoe failure. Alum retannage of

insoles overcomes this difficulty, and insole life is extended about 70%. Chrome retannage also increases insole serviceability, but the process involves use of scarce chromium compounds, whereas alum retannage utilizes readily available aluminum compounds.

Tannin from Canaigre Roots. The Eastern Branch has studied the tannin obtained from experimentally-grown canaigre (*Rumex hymenosepalus*), a wild plant native to southwestern United States. The roots, when dry, contain about 20 to 35% tannin. By water extraction, tanning extracts have been made that compare favorably with commercial extracts. Leathers of the sole leather type have been successfully tanned with tanning blends in which 50% of the tannins used were from canaigre. These leathers, when tested in actual service tests, gave wear results fully equal to those obtained with similar leathers from the same hides tanned entirely with commercial tannins. This tannin thus represents a potential domestic tannin source producible as a new farm crop.

Color Standards for Maple Sirup and for Extracted Honey. Color has long been an important factor in the grading and marketing of maple sirup and honey. In order to improve the reliability and uniformity of classification of these products, the Eastern Branch assisted other agencies of the Department by development of glass color standards for maple sirup and later for honey. The previous color standards for maple sirup had been solutions of caramel in glycerin but they faded with use and were unsatisfactory. The new glass color standards are permanent, more closely controlled for color, and are mounted in a greatly improved metal comparator or viewing box. A sample to be graded, contained in a 1.24 inch square bottle, is placed in the comparator between adjacent color standards and classified as "Light Amber", "Medium Amber" or "Dark Amber" by comparison with the glass standards. The new standards are now the official U.S.D.A. Color Standards for Maple Sirup, and are in use by inspection agencies, producers, and buyers. Complete grading sets are commercially available. Similar permanent glass color standards have been developed for extracted honey. A complete grading set includes two comparators, each equipped with three glass standards. These are now the official U.S.D.A. Color Standards for Extracted Honey.

High-Flavored Maple Sirup. A simple low-cost process for enhancing the flavor and color of maple sirup has been developed by chemists of the Eastern Branch. The process consists of boiling pure maple sirup until sufficient water is removed to raise the temperature to between 240 and 255°F. The boiling is continued at this temperature for about 3 hours. This treatment greatly augments the flavor intensity of the sirup, so that when it is blended with from 3 to 6 times its volume of cane sugar sirup, the resulting blend is virtually identical with that of the initial pure maple sirup.

Several firms are using this process to produce high-flavor maple sirup, and a number of new commercial concentrates and blends based on the process have appeared on the market. Other new products and applications of this process are now being developed, including those for the tobacco and ice-cream industries.

This development of a low-cost, full-flavor blend of high quality is expected to provide an expanded market for maple sirup and at the same time supply consumers with an improved product at lower cost.

Plant Sources of Cortisone. Chemists of the Eastern Branch are conducting an extensive chemical study of wild plants in a search for substances (steroids) which can be converted to cortisone. This drug is widely used for the treatment of arthritis, inflammatory eye diseases, asthma and other ailments.

Thus far several different types of steroids have been found, principally in the yucca, agave and dioscorea species of tropical plants. These substances are promising raw materials from which cortisone and other medicinals may be made.

Agronomic studies are now being conducted on the species which contain sufficient quantities of the steroids to indicate possible commercial development.

Antibiotic Agent from Tomato Leaves. Chemists of the Eastern Branch have isolated an antibiotic agent called tomatine from the leaves of green tomato plants and have found that it is related to the disease resistance of the plants. Thus, in tomato varieties which are susceptible to *Fusarium* wilt, the tomatine gradually disappears and there is no tomatine in the wilted and dying plants. On the other hand, the tomatine is maintained at a high level in resistant varieties able to survive even though the plants are badly infected. Moreover, in laboratory tests, tomatine shows activity against pathogenic fungi which attack man and for which there is no effective chemotherapeutic agent. This substance, which is a glycosidal alkaloid, can be readily converted to tomatidine, a steroidal secondary amine, which is a potential source of sex hormones.

Honey-Fruit Spread. Chemists at the Eastern Branch have developed a new flavorful honey-fruit spread, which is being made commercially by at least two firms. It is prepared by mixing good-flavored honey with fruit juice or fruit puree, evaporating part of the water, and crystallizing the residue to a smooth, nonsticky consistency. The spread combines the honey and fruit flavors. Honey-raspberry, honey-orange and honey-grape are among the more popular combinations.

Flour from White Potatoes. Because of the large surplus of potatoes in 1948 and the increased European demand for potato flour, the Government diverted substantial quantities of potatoes to flour manufacture for shipment to Europe. This immediately presented the problem of finding additional manufacturing facilities, since the potato flour manufacturing capacity of 15 to 20 million pounds yearly was entirely inadequate to produce the 350 million pounds of flour required. As the result of pilot-plant studies carried out at the Eastern Branch a process was devised by which double-drum driers in distilleries could be adapted to make flour. This process and modifications of it have been used to produce large quantities of potato flour.

Engineers of the Eastern Branch also developed an entirely new process for making potato flour at a cost about one-third below that for the standard procedures used. The new process is cheaper because it converts whole potatoes into flour without the conventional peeling and cooking and it employs low-cost drying methods. Lowering the cost of producing potato flour should result in an expansion of the market for this product.