

PROBLEMS, WE, AS OFFICIALS, HAVE IN COMMON WITH
THE TRADE.*

BY ARNO VIEHOEVER.†

Close examination of the evidence collected in the trade of crude drugs, spices and food products will show that practically the same problems which confront the honest dealer confront also the official entrusted with the enforcement of the Food and Drugs Act.

Inadequate methods of handling the raw product from the time of collection until it reaches the consumer frequently are the cause for a condition to which both dealer and official justly object. Carelessness during gathering may result in excessive dirt and account for the presence of plant material other than that wanted.

Inadequate drying may change the normal appearance and composition of the product. Insufficient drying will induce subsequent spoilage by mold or bacteria. Neglect in shipping and storing will without fail injure the raw product often to such an extent that no amount of subsequent care will eliminate the harm done. The consideration of principles applied during handling of perishable products will be a forceful means to obtain and preserve products of high quality.

These principles, as a whole, should be better understood. As they have recently been worked out jointly by Mueller and Viehoever¹ for crude drugs and spices, they may be discussed in brief.

Collecting.—Leaves, flowering tops, and herbs are usually collected at the time of flowering. Dry leaves and flowering tops contain not more than 10 percent of stems. The whole herb should represent true proportions of leaves, flowers and small stems as found growing under normal conditions. Since large or woody stems are practically valueless, their removal usually enhances the value of the drug. Flowers should be gathered when they show the first signs of opening. Tree barks are usually collected in the spring when the sap flows, since they are easiest to peel at this time. Glucoside-containing barks, such as wild cherry, are collected in the autumn or winter, before the sap begins to flow. When the drug consists only of inner bark, the outer bark can best be removed before peeling and drying. All surplus wood should be removed from the bark before or after drying. Root barks are best collected in the autumn. In general, rhizomes and roots of perennial plants are collected in the autumn at the end of the growing season. Spring digging of roots must be done before the plant shows indications of beginning the new season's growth. Roots of annual plants should be collected just before flowering. A few biennials and perennials, whose roots become very woody and quite valueless in two or more years, should be collected at the end of the first year of growth from seed. Seeds and seed-like fruits should be collected when ripe. Certain seed-like fruits such as cubeb, allspice, cardamon, and black pepper, are collected when nearly ripe.

Drying.—Drugs and spices can be adequately dried for storage by regulation of temperature, humidity and circulation of air. The loss of moisture in drying should be steady. If heated, the temperature should be gradually raised, not over 35° C. in the case of flowers and drugs containing volatile constituents, and, as a rule, not exceeding 40° C. to 50° C. in other cases. Higher temperatures may cause undesirable changes in chemical composition of the drug.

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† Pharmacognosy Laboratory, Bureau of Chemistry, Dept. of Agriculture.

¹ For use of the U. S. P. Revision Committee.

Cleaning Fresh Drugs and Spices.—Leaves, herbs, and flowering tops with excessive amounts of adhering soil should be cleaned by agitation or light beating before the drug becomes completely dry and brittle. Much of the soil adhering to roots, rhizomes and tubers can be removed with the fingers or by shaking at the time of digging. Freshly collected plant parts, especially roots, can be successfully cleaned by washing and a satisfactory drug results if the material is dried under proper conditions. Washing should be practiced as soon as possible after collection, before the fresh drug has an opportunity to wilt or dry. The drug should not be left in the water longer than is absolutely necessary for effective cleaning and should then be quickly air dried, spread out thinly and turned frequently, to facilitate even drying. Seeds or seed-like fruits should be cleaned by sifting or winnowing before being packaged.

Cleaning Dried Drugs and Spices.—Dried drugs containing excessive extraneous material of an undesirable nature must be sorted by hand, unless practical mechanical means for cleaning are available. Impurities differing from the drug parts in size or shape can usually be separated by sifting. If the impurities differ from the drug in specific gravity, they can be removed by applications of regulated air blasts or suction, or by means of special machines which operate on the gravity principle. Gravity separations by means of liquids can be practiced on drugs which are quite impermeable and whose active constituents are practically insoluble or unaffected by the liquid used to effect the separation. Bits of iron or steel can be removed with magnets.

Storing.—Crude drugs and spices should be stored in a cool, dry place, protected from light. Drugs stored at a temperature of 50° F. or below are not attacked by insects. Hygroscopic drugs should be stored in special containers, over a dehydrating agent such as lime, or in rooms whose humidity can be kept low. Small lots, 100 pounds or less, subject to attack by rodents or insects can be preserved in closed containers to which, for every pound of drug, a few drops of chloroform or carbon tetrachloride are added from time to time. Large lots can be preserved from injury by fumigation with hydrocyanic acid or carbon disulphide.

In order to obtain a fair idea of the general condition adequate sampling, and satisfactory methods of analysis are an evident necessity. A few suggestions may therefore be added:

Sampling.—In sampling crude drugs and spices it is essential that the samples drawn should be truly representative, thus giving an accurate index of the condition and value of the entire lots. A sample made by mixing portions drawn from the top, middle and bottom of the package usually fairly represents the material in the remainder of the package. Seeds and seed-like fruits can best be sampled by using an instrument similar to the standard grain sampler. A sample of about half a pound for an individual package, and about one pound for a composite is in most cases sufficient for detailed examination. The size of the sample and the number of packages to be sampled will depend upon the nature and condition of the material, as well as upon the judgment and experience of the sampler. At least 10 percent of the packages should be sampled, in lots of 100 packages or more, while an increasing greater percentage should be sampled in smaller lots. Large samples or composites can be reduced by quartering. When sampling crude drugs the physical condition and odor of each package should be noted to ascertain possible damage.

DETECTION AND ELIMINATION OF DIRT.

The presence of dirt in marketable products, whether they be foods or drugs, is highly undesirable. The same amount may be quite conspicuous in some products, such as seeds or fruits, and not noticeable in others, such as hairy leaves

or powdered spices. It may be mentioned here that the Federal Government has undertaken a nation-wide campaign, in order to eliminate obviously dirty drugs from the market. A press notice, sent to trade papers and the daily press, informed those interested of the Bureau of Chemistry's plan. A letter endorsing the press notice, sent to the dealers in the primary markets as well as those in manufacturing districts, requests close coöperation. Both may be here quoted as of possible interest, not only for the information conveyed, but for the exact procedure followed:

LETTER TO DEALER.

"There is enclosed herewith copy of a Press Notice which may be of interest to you. It has been prepared from information supplied by this Bureau and expresses the action contemplated. In order that the campaign may be successful in full measure your close coöperation is highly desirable.

Trusting that our joint action will result in the general improvement of crude drugs, domestic as well as imported,

Very truly yours,

W. G. CAMPBELL,

Acting Chief."

PRESS NOTICE.

Start Campaign to Make Crude Drugs Cleaner.

"A campaign to eliminate excessive dirt from crude drugs has been started by the Bureau of Chemistry, United States Department of Agriculture, which is charged with the enforcement of the Federal Food and Drugs Act.

"An investigation by the Bureau shows that the shipping of dirty domestic crude drugs is a rather widespread practice and is due largely to carelessness in gathering. Excessive dirt constitutes adulteration in crude drugs shipped within the jurisdiction of the Federal Food and Drugs Act. In some instances crude drugs were found to contain 20 percent or more of dirt.

"This practice results not only in an economic loss to the purchaser who usually buys the crude drugs by weight but obviously lessens the medicinal value of the drug. This condition may be dangerous to the user, restrict the sale of the drug, and consequently lower its market value. Care on the part of the gatherer would prevent this great excess of dirt. The dealer who ships the crude drugs into interstate commerce is responsible under the Federal Food and Drugs Act and should take steps, say the officials, to correct this condition in order to free himself from liability to prosecution.

"Ordinary care such as is exercised in marketing garden products such as carrots, turnips or spinach is usually sufficient. For instance, the washing of the fibrous roots, such as goldenseal or unicorn root, before drying would materially improve existing conditions, in the opinion of the Bureau. Inspectors have been directed to give special attention to shipments of crude drugs. Appropriate action under the Federal Food and Drugs Act will be taken in all cases found to be in violation of the law, it is said."

Dealers themselves have repeatedly tried to remedy this condition, but only a few houses, exercising a sharp control, have apparently succeeded in getting the clean drugs they want. Some of the standards, such as that for unicorn root in the National Formulary, are arbitrarily based on samples which have been carelessly collected and consequently contained 10 percent or more of dirt. It is confidently hoped that the State officials will join in this campaign.

A fair judgment as to the amount of dirt can often be obtained by using a very fine screen, even bolting cloth, through which the dusty sand passes. Another means, from which we hope a good deal, is the flotation of the material with carbon tetrachloride. Uniform drugs of small size, such as the Umbelliferae fruits, caraway, cumin, anise, etc., may be floated directly; others may preferably be pow-

dered. The plant material floats, being specifically lighter, and the dirt, as a rule, sinks to the bottom. This method, while not as accurate as the determination of total and acid-insoluble ash, even from limited data, is believed to give a good indication as to whether the drug is satisfactorily clean or whether it is suspiciously dirty.

OTHER METHODS OF EXAMINATION WHICH CAN BE CARRIED OUT WITHOUT GREAT LOSS OF TIME AND WITHOUT SPECIAL LABORATORY FACILITIES AND EQUIPMENT.

The seeming lack of coöperation on the part of the trade, it is believed, is frequently caused by their unfamiliarity with the more or less involved methods carried out to ascertain whether the product meets the standard or not. Simple tests, facilitating the identification of a product, and detection of the adulterant or substitute, should always be available, even though this value may be limited to an indication rather than an absolute proof. Such simple methods are for instance color tests.

Through a treatment of marjoram with ammonia in the cold or caustic alkali in the hot, the presence of certain adulterants can be detected. Coriaria and althea leaves are colored brown; cistus leaves brownish black; while marjoram leaves remain bright green. Coriaria leaves, furthermore, become intensely black with dilute iron chloride solution, which does not change the color of marjoram leaves.

Maple bark (*Acer spiciatum*), still frequently substituted for crampbark (*Viburnum opulus*), can be readily detected by staining its tissues with dilute iron chloride solution, which colors them black, while viburnum tissue is colored green. The use of sulphuric acid in the differentiation of cubeb from its inferior substitutes is probably well known—only the genuine fruits are colored intensely red, owing to the presence of cubebin.

Heating the dried material in a test tube permits the identification of such drugs as quinine bark, which yields a red tar. It often indicates also the presence of crystalline volatile substances, such as caffeine in tea, coffee, or cassina, the sublimate forming in the colder part of the tube.

A simple exposure of beans of the Lima type to ammonia produces an intense yellow coloring of the tissue called hilum, where the seed was attached to the pods. Inasmuch as the results in this test are probably due to the presence of linamarin, yielding hydrocyanic acid, present only in beans of the Lima type, beans of other types can be readily differentiated. While domestic beans of the Lima type are harmless, certain tropical varieties have been found poisonous. This test with ammonia, then, will be of use in the hands of the official or the importer receiving a shipment of beans for import, in that he can instantly decide whether or not he has before him beans of the Lima type that might be harmful and should be further analyzed to determine the actual yield of hydrocyanic acid.

The list of such tests could be increased, but their value for our purpose is probably sufficiently demonstrated.

The work of the food and drug official will be, it is believed, increasingly appreciated if he assists the trade in collecting and disseminating information concerning the adequate gathering, cleaning, drying, storing, shipping, milling, sampling, examining and reconditioning of our raw products, whether they are ultimately to be used for medicinal, condimental or food purposes, an interesting field of activity that is bound to yield results of benefit to both the trade and the consuming public.