

## SCIENTIFIC SECTION, AMERICAN PHARMACEUTICAL ASSOCIATION

### RELATIONS OF THE U. S. PHARMACOPOEIA AND NATIONAL FORMULARY TO FOOD STANDARDS.\*

BY C. W. BALLARD.

The United States Pharmacopoeia IX and the National Formulary IV while not perfect are, as a whole, admirably suited to the needs of the drug and pharmaceutical analyst. The definitions with exact limits for foreign materials and the statements as to the nature of the latter, eliminate to great extent any quibbling over the different ways in which official standards may be construed and make for a surer, wider enforcement of those provisions of the Food and Drugs Act which relate to drugs. The drug trade, wholesale and retail, is now furnished with exact information, easy of access and readily understood, regarding the standards with which their merchandise must comply. Failure of compliance is difficult of justification by any claims of misinterpretation of these standards and more difficult to explain away if the offender is prosecuted. The clause in the introductory notes restricting the applications of both U. S. P. and N. F. standards to articles intended for medicinal use, does not interfere in any way with the employment of crude or technical grades of drugs or chemicals in the arts or for manufacturing purposes. But this "medicinal use" restriction clause, as we have discovered, is a source of some peculiar and often troublesome situations for the food and drug analyst, the wholesale druggist and the retail pharmacist.

While it is entirely desirable, in most instances, that the proposed use of an article should determine whether or not it must comply with Pharmacopoeial or Formulary requirements, it is difficult to understand why food concerns may sell a mixture of cinnamon bark and cassia buds as ground cinnamon, while the drug trade must supply cinnamon U. S. P. when ground cinnamon is specified. The reasons why we should use U. S. P. cinnamon in medicine, where in most instances it is used as a carminative or flavoring agent, but are permitted to use a lower grade article when it is employed as a food flavor, are not very apparent to the writer. One reason, perhaps the main one, is that the drug trade is governed by the provisions of the U. S. P. and N. F., whereas food industries are regulated by the standards of U. S. Dept. Agriculture Circular 19 and subsequent Service and Regulatory Announcements.

Several articles named in the U. S. P. and N. F. are more used for condimental or food purposes than they are used in medicine. For example, the use of vanillin as a flavor entirely overshadows its medicinal use. In this list of condimental or flavoring articles are several for which there are no official preparations in either U. S. P. or N. F. As matters stand at present and by virtue of the "medicinal use" restriction, these articles, although intended for human use as flavors or accessories in food combinations, do not have to meet the requirements set for their use as flavors or accessories in drug combinations, likewise intended

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for human use. The regulation is that a low-grade condiment or flavor in a food is permissible, but that the highest grade materials must be used for the same purpose in medicine. Considering that both foods and medicinal products of this sort are intended for internal use or human consumption it seems rather illogical to have two standards.

Having reviewed the relations of the U. S. P. and N. F. to the food regulations of the Food and Drugs Act, we turn to the official authorities on the standards of purity for food products as represented by Circular 19 and consider the requirements for various condiments as stated in this publication. In an introductory statement of the principles upon which the standards are based we find the following:

1. The standards are expressed in the form of definitions, with or without accompanying specifications of limit in composition.
3. The definitions are so framed as to exclude from the articles defined substances not included in the definition.
4. The definitions include, where possible, those qualities which make the articles described wholesome for human food."

We will give attention to the first and third of the above principles. When the Eighth Revision of the U. S. Pharmacopoeia became an official standard under the Food and Drugs Act, difficulty was experienced in prosecuting those violating its provisions applying to crude drugs. Definitions which did not permit small amounts of extraneous material were shown to be practically impossible of attainment. Even though the drugs could be separated and freed from all foreign matter, the labor involved would make the price prohibitive and the material gain in quality would be slight. The Ninth Revision takes proper cognizance of this situation by permitting a fixed amount of inert or foreign matter. This arrangement appears to be agreeable to all concerned and the market is supplied with fairly good materials at a reasonable price. The principles quoted above apparently do not allow for trifling amounts of foreign matter which might not materially interfere with the use of a substance for food. The general definition for spices, in Section "D," provides that no portion of the flavoring material must have been removed and that they must be clean, sound and true to name. In the matter of specifications for individual articles mentioned in the text of this section, it will be found that of the thirty-eight items enumerated, extended specifications are given for but sixteen. The balance are disposed of by merely stating the part used and the botanical name of the plant yielding the article. If this type of definition was found faulty in the previous revision of the Pharmacopoeia, the same considerations should make it inefficient in food regulation. Immature or unripe fruits of anise, caraway and coriander will comply with all the requirements fixed by the general definitions of Circular 19. No portion of the flavoring materials may have been removed and they may be clean, sound and true to name, but at the same time be decidedly inferior and represent materials of low grade. Could such materials be considered as fulfilling the provisions of principle No. 4? Would they be as wholesome for human food uses as the pharmacopoeial articles even though the latter contained the trifling amounts of foreign matter permitted by specification?

There appears to be an admission that the standards of Circular 19 are incomplete in the recent adoption of tentative standards for a few articles. Re-

FOOD OR CONDIMENTAL ARTICLES NAMED IN THE PHARMACOPOEIA, FORMULARY AND CIRCULAR  
19, WITH COMPARISONS OF THESE STANDARDS.

Article	Pharmacopoeial or Formulary Requirements	Circular 19 Standards
Allspice	Dried nearly ripe fruit, <i>Pimenta officinalis</i> Stems and foreign matter = 5% max. Ash = 6% max. Fiber = 25% max. Quercitannic acid = .....	Dried fruit of <i>Pimenta pimenta</i> . ..... 6% max. 25% max. 8% min. .....
Anise	Dried, ripe, fruit <i>Pimpinella anisum</i> . Foreign matter = 3% max. Ash = 9% max.	Fruit of <i>Pimpinella anisum</i> . ..... .....
Caraway	Dried fruit, <i>Carum carvi</i> . Foreign matter = 3% max. Ash = 8% max.	Fruit of <i>Carum carvi</i> . ..... .....
Cayenne Pepper	Dried, ripe fruit, <i>Capsicum frutescens</i> .  Foreign matter = 2% max. Nonvolatile ether ext. = 15% min. Ash = 7% max. Ash soluble in HCl = 1% max. Starch = ..... Crude fiber = .....	Dried, ripe fruit <i>Capsicum frutescens</i> or other small fruited species. ..... 15% min. 6.5% max. 0.5% max. 1.5% max. 28% max.
Celery Seed	Ripe fruit <i>Apium graveolens</i> . Foreign matter = 10% max. Ash = 8% max. Ash, acid insoluble = ..... Ethereal oil = .....	Dried fruit of <i>Apium graveolens</i> . 5% max. (Note "A") 10% max. (Note "A") 1.2% max. (Note "A") 2% min. (Note "A")
Cinnamon	Dried bark of undetermined species <i>Cinnamomum</i> .  Volatile ether ext. = 2% min. Ash = 6% max. Ash insoluble = 2% max.	Dried bark any species genus <i>Cinnamomum</i> ; outer layers may or may not have been removed. ..... ..... .....
True Cinnamon	Dried bark, cultivated trees <i>C. zeylanicum</i> . Foreign matter = 3% max. Volatile ether ext. = 0.5% min. Ash = 6% max. Ash insoluble = 2% max.	Dried inner bark of <i>Cinnamomum zeylanicum</i> . ..... ..... .....
Cassia	(Oil from <i>C. cassia</i> )	From various species of <i>Cinnamomum</i> other than <i>C. zeylanicum</i> .
Ground Cinnamon and Ground Cassia	Note "B"	Note "B"
Cloves	Dried flower buds, <i>Eugenia aromatica</i> .  Stems and foreign matter = 5% max. Volatile ether ext. = 10% min. Ash = 8% max. Ash insoluble = 0.5% max. Quercitannic acid = ..... Crude fiber = .....	Dried flower buds of <i>Caryophyllus aromaticus</i> . 5% max. (stems) 10% min. 8% max. 0.5% max. 12% min. 10% max.
Coriander	Dried ripe fruit, <i>Coriandrum sativum</i> . Foreign matter = 5% max. Volatile ether ext. = 0.5% min. Ash = 7% max.	Dried fruit of <i>Coriandrum sativum</i> ..... ..... .....
Fennel	Dried, ripe fruit, cultivated varieties <i>F. vulgare</i> . Foreign matter = 4% max. Ash = 9% max.	Fruit of <i>Foeniculum foeniculum</i> . ..... .....

Ginger	Dried rhizome, <i>Zingiber officinale</i> ; outer cortical layer partly or completely removed.	Washed and dried, or decorticated and dried rhizome of <i>Zingiber zingiber</i> .
	Aqueous ext. = 8% min.	.....
	Nonvolatile ether ext. = 2% min.	.....
	Alcohol ext. = 4% min.	.....
	Ash = 8% max.	6% max.
	Ash insoluble in HCl = .....	3% max.
	Lime = .....	1% max.
Mace	Starch = .....	42% min.
	Crude fiber = .....	8% max.
	Arillode of <i>Myristica fragrans</i> .	Arillus of <i>Myristica fragrans</i> .
	Volatile ether ext. = 8% min.	.....
	Nonvolatile ether ext. = 20-30%	20-30%
	Ash = 3% max.	3% max.
	Ash insoluble in HCl = traces	0.5% max.
Mustard Seed	Crude fiber = .....	10% max.
	Note "C"	Note "C"
Nutmeg	Ripe seed, <i>M. fragrans</i> deprived of arilli and seed coats. Reject wormy or broken kernels.	Dried seed of <i>Myristica fragrans</i> deprived of testa.
	Ash = 5% max.	5% max.
	Ash insoluble in HCl = .....	0.5% max.
	Nonvolatile ether ext. = .....	25% min.
	Crude fiber = .....	10% max.
Pepper (black)	Dried unripe fruit, <i>Piper nigrum</i> .	Dried immature berry, <i>Piper nigrum</i> .
	Foreign matter = 2% max.	.....
	Nonvolatile ether ext. = 6% min.	6% min.
	Starch = 25% min.	25% min.
	Ash = 7% max.	7% max.
	Ash insoluble in HCl = 2% max.	2% max.
	Crude fiber = .....	15% max.
	Nitrogen in ether ext. = .....	3.25% min.
	Stigmas of <i>Crocus sativus</i> .	Dried stigmas of <i>Crocus sativus</i> .
	Foreign matter = 10% max.	.....
Saffron	Nonfusible ash = 7.5% max.	.....
	Loss in wt. at 100° C. = 14% max.	.....
	Dried tops, <i>Thymus vulgaris</i> , collected when in flower.	Leaf and tips of blooming branches, <i>Thymus vulgaris</i> .
	Ash = 14% max.	14% max. (Note "D")
Thyme	Ash acid insoluble = .....	4% max. (Note "D")
	Stems = .....	15% max. (Note "D")
	Ethereal oil = .....	1% min. (Note "D")
Vanilla	Cured, fullgrown, unripe fruit, <i>Vanilla planifolia</i> .	Dried, cured fruit, <i>Vanilla planifolia</i> .
	Dilute alcohol ext. = 12% min.	.....
Coffee (roasted)	Ash = 6% max.	.....
	Dried, ripe seed, <i>Coffea arabica</i> or <i>C. liberica</i> roasted until brown in color and with characteristic odor.	Coffee ( <i>C. arabica</i> or <i>C. liberica</i> ) which by action of heat has become brown and developed its characteristic aroma.
	Caffeine = 1% min.	.....
	Ash = 3-5%	3% min.
	Fat = .....	10% min.

Note "A"—These standards do not appear in Circular 19, but notice of their adoption is given in Service and Regulatory Announcement No. 16.

Note "B"—Ground cinnamon according to Pharmacopoeial requirements would be prepared from saigon or ceylon varieties.

Ground cinnamon according to Circular 19, is a powder consisting of cinnamon (any species of the genus *Cinnamomum*) cassia, or cassia buds, or a mixture of these spices and contains not more than 6% total ash and not more than 2% sand.

Note "C"—The mustard seed of the Pharmacopoeia is intended for medicinal use only and is not well adapted for food uses.

Note "D"—These standards do not appear in Circular 19, but notice of their adoption is given in Service and Regulatory Announcement No. 14.

ferring to Service and Regulatory Announcements Nos. 14 and 16, we find complete specifications for marjoram, thyme, sabadilla seed, savory, fenugreek, celery seed and manna. In looking over notices of judgments under the Food and Drugs Act, I find that in a few instances defendants have been found guilty of misbranding articles mentioned in both U. S. P. and Circular 19, on grounds that the materials offered for sale were *not U. S. P.* even though no claim was apparently made by the defendant that the materials in question did conform to this standard. Oils of cassia and cinnamon were below the cinnaldehyde standards of Circular 19, but adulteration is charged not only on this count but also that the articles were sold under names recognized in the Pharmacopoeia and differed from the standards of purity and strength laid down in the latter. Optical rotation and specific gravity, both of which are not mentioned in Circular 19, figure in the condemnation of the samples. In passing we should note that the U. S. P. demands 80 percent cinnaldehyde and that Circular 19 requires 75 percent in oil of cassia and 65 percent in oil of cinnamon. Oil of red thyme, although not specifically marked U. S. P., was adjudged adulterated and misbranded in that it did not conform to pharmacopoeial standards. Apparently in cases involving articles mentioned in Circular 19, the Pharmacopoeia and the Formulary, all three authorities are used in proving adulteration or misbranding. The question of medicinal use in all of the above cases was apparently taken for granted, as variations from U. S. P. standards form the chief ground in each instance for the judgment. In Service and Regulatory Announcement No. 16, is an opinion that articles sold under names recognized in the index, but not appearing in the text of the Pharmacopoeia, are drugs within the meaning of Section 6 of the Food and Drugs Act. Under this opinion articles like zinc dust, peptone, carmine and the various reagents of Part II are amenable to Pharmacopoeial requirements. Also under this opinion vanilla, milk sugar and several other food or flavoring articles which do appear *in the text* of the Pharmacopoeia and Formulary are released from official specifications unless sold as drugs.

The preceding table clearly illustrates the differences between the drug standards and the food standards for articles mentioned in Circular 19.

Many of the definitions of Circular 19 are faulty in that they do not allow for the presence of trifling amounts of foreign matter, do not rule out immature materials, do not state ash limits and are otherwise incomplete. If such standards have not as yet been worked out by the Bureau of Chemistry, it might be a good plan for this Bureau to tentatively adopt Pharmacopoeial and Formulary standards until their investigations warrant the publishing of complete specifications. Some of the items in the above tabulation are worthy of a few additional words of comment.

*Cinnamon.*—The specification that cinnamon may be derived from any species of the genus *Cinnamomum*, without any further description, appears to be very loose. Any species of this genus might include *Cinnamomum camphora* and several others. The reason for considering Ceylon cinnamon as the true cinnamon is not clear. A mixture containing cassia buds cannot be considered equivalent to pure cinnamon bark for food purposes unless the prejudice against cassia buds is entirely without foundation.

*Fennel.*—It has been demonstrated that cultivated fennel plants produce fruit with more uniform and greater oil yield. The present Circular 19 definition,

by merely specifying the fruit, permits the latter to be gathered from wild plants which are admittedly inferior.

*Ginger*.—The activity of a ginger for medicinal as well as flavoring purposes, depends upon the amounts of oil and oleoresin present. Requirements for this extractive matter are omitted from the present Circular 19 definition and very low grades would meet the specifications there given.

*Vanilla*.—Vanilla cannot be thoroughly dried without injury to the desirable constituents, therefore the definition of Circular 19, if literally followed, would result in inferior grades. The dilute alcohol extractive materials are most valuable for flavoring purposes but the Circular does not specify any amount of such materials.

*Volatile Oils*.—In the case of the volatile oils, many of those mentioned in Circular 19 are entirely without standards. In prosecutions the Pharmacopoeial requirements are used in proving adulteration. It might be well to adopt the definite standards of the U. S. P. and N. F. to this class of materials, with exceptions for those intended for special uses.

Owing to disturbed commercial conditions of the past few years, merchants have been compelled to secure supplies from every possible source. Undoubtedly considerable material held by food manufacturers has found its way into drug channels. Citric and tartaric acids purchased by wholesale grocers and confectioners and used by them in food manufacture, have been resold to wholesale druggists presumably to supply their trade. These acids if sold by grocers and confectioners do not have to meet all the provisions of the Pharmacopoeia. If sold by a druggist, the same articles must conform to all official requirements or be sold as "technical" or "not U. S. P."

The situation may be summarized by the statement that the highest quality materials must be used for medicinal purposes, whereas lower grades may be sold as foods. In both instances the articles are intended for human consumption and in most cases enter the stomach in the same condition and have the same action there. Aside from the question as to whether these dual standards are unduly favorable to the food manufacturer and discriminatory toward the druggist, they tend to complicate the work of the analyst.

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### SENNA BEANS.\*

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A sample of Senna Beans was submitted recently for investigation as to their medicinal value. The species from which they were taken was not stated.

The beans were about 15 millimeters in length, about one-third as broad and one-fourth as thick, slightly kidney-shaped and very hard. Externally they were slate-colored, internally grayish white, resembling most beans in color. The taste was mucilaginous, slightly acrid and nauseous. They contained a large amount of proteid (probably legumin) and a small amount of sugar, but no starch.

Tests for alkaloids and glucosides were negative. Tests for anthraquinone bodies were also negative. The beans were entirely devoid of the cathartic principles which are found in senna leaves and pods. In other words the tests disclosed no medicinal value whatever in the beans.

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